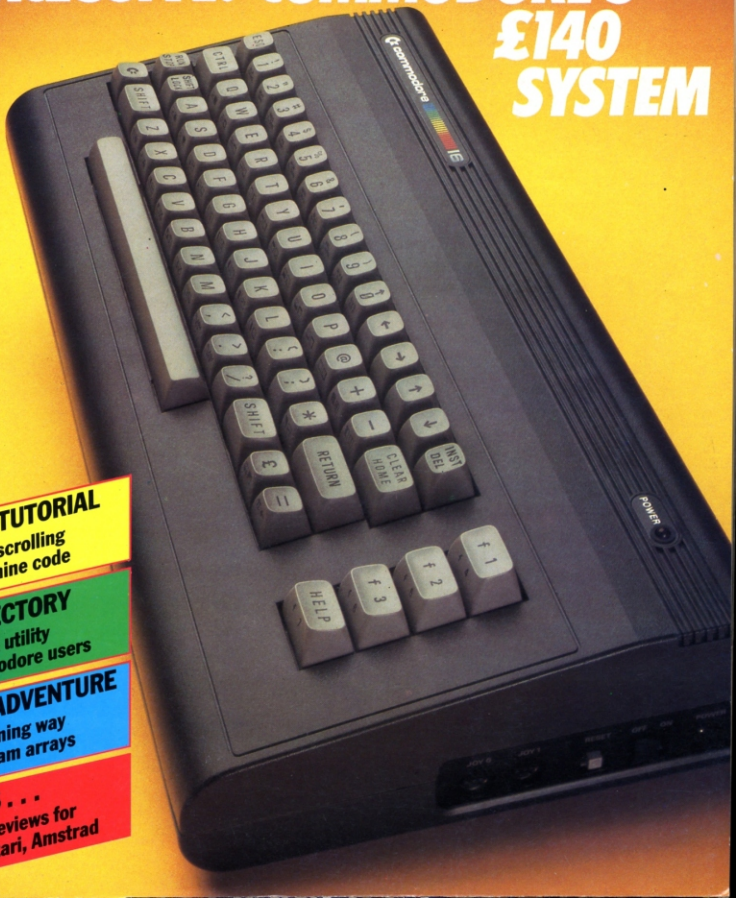
PERSONAL
COMPUTER
weekly NEWS
SEPTEMBER 8 · 1984 · No77 50p

C16 EXCLUSIVE: COMMODORE'S £140 SYSTEM



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Product reviews for 64, BBC, Atari, Amstrad

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MENU

September 8 1984 No 77

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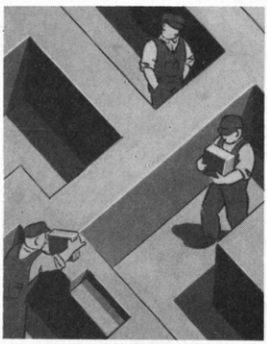

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Creditors rally to Oric

By Ralph Bancroft

Major creditors of cash-starved Oric Products were due to get together this week to work out ways of seeing the company through its current problems (issue 75).

The current cash problems were made worse last week when Oric went to court to answer a writ from KMP, its advertising agency, claiming £200,000 in unpaid bills.

This is one of the actions that released the tide of speculation over Oric.

The court threw out a counter claim from Oric that KMP had provided it with wrongful advice and ordered the company to pay the money it owes along with KMP's legal costs.

It is believed that Oric owes its creditors a total of around £4 million, but not all of them are as anxious as KMP to secure immediate payment.

Assembly and Automation Electronics, the company that manufactures the Atmos, is taking a sympathetic view of Oric's difficulties.

'We are fairly confident that Oric will be able to meet its debts,' said Keith Arnold, A&A's managing director. 'It is just going through a cash flow problem. There are a lot of orders in hand.'

He confirmed that some of Oric's creditors were meeting to discuss ways of helping Oric out. 'Most creditors are very supportive of Oric,' he said.

Also involved in the discussions is Hitachi, which supplies disk drives and other components to Oric.

Andy Killick, Hitachi's product manager, said that it was: 'only a very small creditor' but refused to go into any further detail.

'I would not like to prejudice any meeting that may take place,' he said.

Industry analysts suggest that Oric's debts are more than covered by value of the property owned by Edenspring Investments, Oric's parent company.

But selling off property assets is something of a drastic measure to meet what may just be short term debts.

A more likely outcome is that Oric's creditors will agree to reschedule the debts so the money will not have to be paid until pre-Christmas sales start to take off.

Tandy makes first cut to cost of book-size portable

Tandy has cut the price of its A4-sized Model 100, the last series of Tandy cuts but possibly the opening shot in a portable price war.

Apart from a short promotion earlier this year, Tandy has held the price of the popular Model 100 steady since its launch last July. But from September 1, the 8K version checks in at £449, down £50, and the 24K model at £579, a reduction of £70 from the price tag of the last 12 months.

A spokesman said that Model 100 had been: 'an unqualified success from Tandy's point of view', but he added ominously that the price cuts had been prompted by 'a desire to remain competitive in the lap-held market'. Tandy's main competitors, the NEC 8201A and the Olivetti M10, come in at £475 and £499 respectively.

Model 100 — now coming in at £26 less than NEC's 8201A.

Camputers deal closer

It looks as though Camputers may have found a saviour in printing and stationery multi-national Spicers International.

A spokesman for Camputers' liquidator Hacker Young confirmed that talks with Spicers were at an advanced stage, although he declined to comment on what shape a potential deal would take.

Spicers also declined to comment. The director in charge of the negotiations is currently away on his honeymoon.

BBC business prices on roller coaster ride

The Acorn Z80 second processor has jumped £100 in price to £399 — but what you lose on the swings you may gain on the roundabout, because the price of the BBC single disk has come down by £50 to £199 at the same time.

The Z80 board, launched in May (issue 61), comes with various items of bundled software besides CP/M 2.2 and GSX. Is is the cost of supporting this software that has been the main cause of the price increase — for dealers to offer a reasonable service Acorn has had to give them larger margins.

The reduction in the 100K disk drive comes, Acorn says, from more efficient sources of supply and the need to remain competitive. It follows a barely publicised reduction of £105 to the price of the 800K dual disk drive, which now costs £699.

Acorn's Z80 with two disk drives still struggles to be competitive with the Torch Z80 Disk Pack for price — Torch's ZDP240 gives 800K, a Z80, and bundled business software for £805. And for users assembling a business system around a BBC micro there is the further alternative of the Rade R50 board (issue 76), which lets you pick the software you want. Acorn has no plans at the moment to offer a Z80 unit without the accompanying software.

The Acorn Z80 second processor has been selling 'by the thousand' every month, a company spokesman said. Where the BBC is being used as the hub of a business system Acorn aims to get as close as it can to the mainframe/minicomputer idea of a turnkey system, where you simply set it up, plug in and go.

But CP/M is popular enough to offer its own alternatives.

Acorn muscles in on Torch

By Ralph Bancroft

Acorn is making itself felt at Torch Computers even before its agreed takeover is finalised.

It has replaced Torch's chairman and managing director Bob Gilkes with Peter O'Keefe, Acorn's sales director. Mr O'Keefe will combine the job of chief executive at Torch with his existing position at Acorn.

In a statement from Acorn Mr O'Keefe said that his first task will be 'to give a strong sales-led direction to Torch's management' and 'develop Torch's credibility to enable the firm to capture large market shares.'

This implied criticism of Torch's existing management may go some way to explaining Mr Gilkes' departure. In the usual euphemistic language that these kind of statements are couched in, Acorn says that Mr Gilkes 'has resigned to take up other interests in the computer industry.'

However, sources close to Torch suggest that Mr Gilkes was asked to leave after Acorn complained to Newmarket Venture Capital, Torch's current owners.

Acorn was far from pleased with the way that Mr Gilkes signed an exclusive licensing agreement with Data Technologies to manufacture and market the Graduate IBM-compatible add-on for the BBC micro. This was in conflict with Acorn's plans in the same direction.

In fact, the Graduate is still experiencing teething problems and the lastest design change is the addition of a fan to cope with overheating problems.

Acorn was also unhappy with the way that Torch jumped the gun in announcing the takeover plans before they were complete. Officially: 'negotiations are now well advanced for the takeover to be completed.'

Mr O'Keefe's appointment raises more questions than answers as to why Acorn is buying Torch and what it proposes to do with it.

Acorn said in the statement that it expects Torch to provide a 'firm platform' for its thrust into the business market. Yet in an exclusive interview with *PCN* last month (issue 72), Chris Curry, Acorn's chairman, said that the company was going ahead with its plans to launch a range of business machines of its own this Autumn.

With Torch and Acorn offering competing ranges of business micros something will have to give.

QDOS under fire

A change of heart from GST Computer Systems has given Sinclair QL users a direct alternative to the QDOS operating system.

Originally GST planned to sell its 68K/OS multi-tasking operating system only to micro manufacturers and distributors (issue 67). But the reaction to the 68K/OS has been so good that it has decided to offer it on mail-order to end users.

'We didn't know what the demand was going to be,' said Chris Scheybeler, who is in charge of the 68K/OS project at GST. 'After showing it to a number of people including the independent QL user group, we decided to change our mind,' he said.

The operating system comes on a board that plugs into the internal expansion port of the QL. The board includes two spare 16K EPROM sockets for ROM-based software and a switch to allow the user to select either QDOS or 68K/OS.

It will sell for £99.95.

It offers QL users full multi-tasking, multiple screen windows and device-independent input/output, and it works with bit-mapped graphics. A pipe utility allows you to transfer data from one program to another program running concurrently.

Yet for all its facilities it still squeezes into 32K of EPROM.

GST will be including with the board a tape containing a text editor and file transfer utilities.

GST has also brought out a version of its 68000 assembler for 68K/OS. Called 68K/ASM it sells for £39.95. Initially software for 68K/OS is likely to be in short supply. GST is working on a word processor which should be ready shortly, to be followed by Pascal and Fortran.

One product that won't be available is a 68K/OS version of Psion's integrated software.

The success of the operating system will depend on the flow of software from third parties but this is unlikely to happen on any significant scale until next year.

A major factor is the negotiations between GST and hardware manufacturers about putting the operating system on soon to be launched 68000-based micros.

Dawn chorus for Radio 1 Chip Shop

Early risers can look forward to a new series of BBC Radio's Chip Shop, which from September 29 is opening for business on Radio 1 as well as returning on Radio 4.

Unlike normal chip shops the Radio 1 version is on at 7.33 am. A bonus for the bleary-eyed is that it will be graced by PCN's popular Games Charts. The program, presented by David Freeman, will run until about 7.45 am.

Radio 1 will also be broadcasting software in the Basicode format at the unearthly hour of 5.55 am every Sunday morning. The BBC has issued an upgraded version called Basicode 2+, which is now suitable for the Spectrum, MSX range, Electron, Dragon and Oric systems. The Basicode 2+ kit costs £3.95 from Broadcasting Support Services, 2 Cater Road, Bristol BS13 7TW.

Radio 1 will be inviting you to try your hand at submitting Basicode programs for transmission — but you should note that since the Dutch originators of Basicode intended it as a non-profit-making venture, you're not likely to see much in the way of rewards.

The returning Radio 4 Chip Shop, with Barry Norman, starts its new season at 4.15 pm on September 15.

Autumn fall

The Autumn bonanza of new software is upon us again. With new releases from Hewson, Micro-Gen, and announcements from Software Projects, amongst others, September 1984 looks very promising indeed on the software front.

Quicksilva is due to release author Sandy White's follow-up to Ant Attack. The game will be called Zombie Zombie will cost £6.95 and will use White's special programming technique to create an illusion of three dimensions.

A version of 'Ant Attack' for the Commodore 64 has been promised for some time and it now looks as if patient 64 owners won't have to wait much longer.

Axe hits Atari 600XL

Jack Tramiel's axe has fallen on the Atari 600XL. Heads have rolled down the corridors of the executive suite since his takeover of Atari — now the product range is suffering its first casualties.

The 600XL is not yet officially discontinued in the UK but a spokesman said last week: 'The main emphasis now is on the 800XL.'

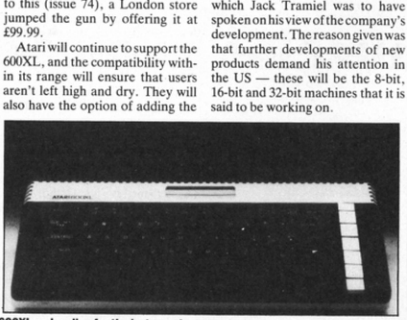
Atari's market research, he said, showed that the market (*ie* people buying micros) was moving towards 64K machines. 'The 64K 800XL will naturally take precedence over the 600XL, which will continue to be sold while current stocks last.'

The expression 'current stocks' is the death knell for the 600XL. Mr Tramiel, founder of Commodore and now apparently determined to grind the company he founded into the dust, is reported in the US to have discontinued all Atari's home micros with the exception of the 800XL. That machine now costs £200 in this country.

The 600XL's number came up two weeks ago, when it too came down in price to below £100. Prior to this (issue 74), a London store jumped the gun by offering it at £99.99.

Atari will continue to support the 600XL, and the compatibility within its range will ensure that users aren't left high and dry. They will also have the option of adding the £90 memory module that effectively turns it into an 800XL.

As to the future, Atari UK has cancelled a press conference at which Jack Tramiel was to have spoken on his view of the company's development. The reason given was that further developments of new products demand his attention in the US — these will be the 8-bit, 16-bit and 32-bit machines that it is said to be working on.



600XL — heading for the last round- up.

IN BRIEF

End of an era?

Evidence is mounting that home micros are coming to the end of their golden age. Following the Gowling report (issue 73), BIS-Pedder's 1984 census of computers detects a 'mounting dissatisfaction among users who want to be more adventurous'.

As a result, the company concludes, you're likely to forsake games micros and not replace them. It describes this as the home computer bubble bursting, a messy prospect that could see sales of carpet cleaners go through the roof.

Commodore's boom

Commodore UK has rounded off the year in which it gained the Royal Warrant by topping £100 million in sales. Around the world Commodore took $1.27 billion, but 1985 is likely to be tougher with ex-Commodore boss Jack Tramiel drawing the battle lines at Atari.

User group quartet

White Lightning, featured on the cover of *PCN* issue 74, has attracted enough interest for two user groups to be formed. Occam and Sanyo MBC-550 groups have also been set up in the last two weeks.

The White Lightning groups are at The Model Shop, 10-16 Queen St, Belfast, and Mr M Richards, 8 Victoria Rd, Roche, Cornwall. The Occam User Group's secretary is Dr Michael Poole, Inmos Ltd, Whitefriars, Lewins Mead, Bristol BS1 2NP. Sanyo users should contact Tom Drake, 143 Glebe Avenue, Ickenham, Middlesex UB10 8PF.

Aries Rampage

Memory expansion for the BBC comes a little cheaper as a result of Aries Computers' (0233 862614) decision to cut the price of its B20 20K RAM pack.

The expansion pack comes down by more than 30 per cent to £79.95. It coincides with the launch of the B12 sideways ROM expansion unit, and also with an uncompromising denunciation by Aries of 'cheap imitations' of the B20.

ACT to IBM swap

New software from Apstor (0273 422512) will let users of IBM, Sirius and Apricot systems interchange data by means of removable cartridge storage devices.

The arrangement applies to Apstor's Beta 5, Alpha 10 and Gamma 20 units.

Century saver

Pocket-money software began as a breakthrough, became a trend, and is now almost standard with the emergence of another company selling games for £1.99.

Century City Software (0384 57077) has launched four Spectrum games at £1.99.

VIEW FROM JAPAN

Portables and problems that don't go away

By Serge Powell

I've heard it said that portable micros have no place in serious computing. Not the 28lb Charles Atlas portables, the A4 Epson/Tandy 100/NEC/Olivetti/H-P 110 style.

These lightweight portables, some say (and you can recognise them by the redness around the eyes that comes to anyone who spends any time with their head in the sand), have deficient displays, sparse storage, and few real functions.

The truth, as usual, is a platitude — you don't miss something until it's not there any more, in this case computing power.

There is one undeniable satisfaction about writing for a magazine that appears halfway around the world from where I live, and that is that unless I show it to her there's no likelihood of my wife accidentally coming across my column. So I can confess: during the 12 days I just spent in Pakistan I missed a computer more than I missed my wife and kids.

This may sound heartless, especially as families (under favourable circumstances) can be just as portable as micros. But however strong they may be on moral support wives and offspring come up woefully short in the data processing department. I blame the system designer.

In fact, before I go anywhere again I'm going to make sure I take along a portable with word processing and database software, especially if I go with a group of 56 reporters, TV production people, various hangers-on, and the stars of the show — a group of Japanese, Korean and US wrestlers staging charity bouts to raise funds for Afghanistani refugees.

And especially if I'm responsible for keeping everybody advised as to their schedules, which for reasons various and sundry broke the 56 down into two large groups, four small, and three of only one person each. All of them spent a lot of time going to different places at the same time.

The inclement weather and an innate Third World inability to treat time, space and the universe on any but a fatalistic, carefree, 'what's everybody getting so excited about' level and numerous other cataclysms required endless and countless changes to the schedules I'd so neatly prepared, personalised and printed back home on my desk-bound micro, schedules that looked like a Race Tote scratch sheet by the end of the trip.

In any case, if I wasn't before, I'm now a firm believer in portable computers, disk drives and printers, and have also had good cause to promise never again to complain when the micro and the rest of the hi-tech stuff I surround myself with performs less than perfectly. I've seen tech at its lowest.

Our group had the not-so-easily arranged privilege (I spoke with one reporter who after three months had still not received a permit) of visiting an Afghanistani refuge camp. Like most chip-heads I admire our more capable fellows who can scrape together electronic bits and pieces to build computers, but my mind is still numb from the sight of people who must scrape together their homes, so low-tech that the building materials are straw and mud, and who must daub the outsides with cow-dung so that it will dry faster so that they can use it as fuel, and then live on the 50 cent allowance they receive as refugees (the cost of a Coca-Cola in our hotel).

Now I've got that off my chest, back to the purpose of the column, which is personal computer news. Apparently Air Pakistan has recently modernised its offices by buying some 200 Apples, and has worked out some kind of deal to manufacture or assemble or act as sales agents for Apple in Pakistan

This may not be big news for you or me, but now that I've seen how the other two-thirds of the world lives I'm in favour of any step forward. Apples as fruit might be more appropriate than micros but who's going to quibble? Micros are working minor miracles everywhere else, why not where miracles are noticeably thin on the ground?

Protek makes modem pitch

With most people buying directly connected modems it seems ambitious to bring out a new acoustically coupled modem.

Protek Computing takes a different view. Its 1200 modem is at £59.95 the cheapest Telecom-approved modem on the market.

Also it thinks there are large numbers of parents out there who would be horrified at the thought of their son or daughter plugging directly into the telephone line.

Protek is likely to find a market too among the growing band of lap-held micro users who want a modem they can carry around with them.

As the name suggests, the 1200 modem is designed to operate at 1200/75 baud, full duplex for connection to Prestel and other computers and for user-to-user communications.

Along with the modem, Protek is selling a range of interface packs for popular micros. These include the software to allow you to access Prestel and to communicate directly with other micro users.

Interface packs for the BBC and the Commodore 64 will cost £14.95, and £24.95 for the Spectrum.

These will be available along with the modems from around the middle of September in branches of Menzies, WH Smith and Boots.

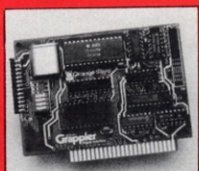
Protek 1200 — modem à la mode.

Additonal interface packs for the Atmos, Electron, QL, Amstrad and MSX machines should start appearing by the end of October.

Protek has no plans to release interface packs for the lap-held micros. So users of the NEC 8201A, Tandy Model 100 and the Olivetti M10 will have to rely on the terminal software that comes with the machine.

This means they will not be able to use the modem at 1200/75 baud.

GRUNT AND GROAN — Grappler fans will be pleased to learn that Orange Micro, doyen of grappling, has released a serial version of its Grappler+ printer inteface. For Apple II, II+ and IIe users it includes 25 firmware commands to take care of (among others) high-resolution graphics and 80-column text screen dumps. It can also accept an additional buffer module, Bufferpak, with 16K to 64K of printer memory. No UK prices have been set yet.



Second-hand's hour nears

'Old micros for new' doesn't sound like the most promising sales slogan but there may be more to the second-hand market than meets the eye.

Carston Electronics (01-943 4477) is taking a side-swipe at the quality control of the manufacturers at the same time as launching itself on a career in selling second-hand micros. 'One of the less well understood benefits of buying used equipment,' it says, 'is that, when properly maintained, it is often more reliable than brand-new.'

The company, previously specialising in refurbished test instrumentation and equipment, is moving into used computers and peripherals. The smallest system it will handle will be about the level of the Apple II series, and its prices (depending on the quality of the system) could be 50 per cent below the cost of a new machine.

For the sake of buyers' peace of mind it promises to test, re-condition and guarantee used equipment to operate 'as new'. 'We're not too impressed with manufacturers' quality control,' said a spokesman, hinting that the performance of its kit might in some cases be better than brand-new equipment.

With other companies, Carston is opening a second front in the price war.

There are also organisations planning auctions of used computer equipment. Besides the immediate price advantages to buyers, they should between them exert more pressure on the original manufacturers to raise their standards.

Acorn row looms

By John Lettice

A grim spectre haunts the micro industry — the spectre of humourless and trigger-happy micro manufacturers. The long hot summer now drawing to a close could end with a low-key cat-fight between Acorn and Future Computers.

The controversy in question is roughly as follows:

■ First, Future Computers advertises its new system as the only micro system with built-in networking.

■ Then Acorn contacts the Advertising Standards Authority, the magazines the advertisements appeared in, and Future Computers to dispute a number of points made in the ad, and hints to the magazines in question that they might like to avoid printing it again.

Acorn, it should be noted, has taken on a micro magazine in the past (issue 42).

■ Future Computers turns pale (we don't know this for certain, but it adds a certain amount of colour to the story) and makes a few amendments to the ad.

■ The Advertising Standards Authority tells Future it's OK to carry on running the ad pending the results of its investigation.

■ Acorn doesn't like the new-look ad either.

■ Future holds a press conference, inviting Acorn, explaining that the BBC doesn't have built-in networking, and saying that it's a bit out of order demanding cave-ins of magazines when there's an ASA case pending. Acorn doesn't turn up.

■ Acorn issues a press release disputing Future's claims, and complains about the press conference.

When asked about the affair an Acorn spokesman whimpers gently and puts the company's case for the ninth time. Acorn's pitch is that cheap networking is possible on the BBC B, so it's wrong for Future to say methods of networking prior to its own cost 'several tens of thousands of pounds,' and that 'now you can afford to benefit from a Future network at a fraction of anything else on the market.'

Future's pitch meanwhile is that the BBC B isn't comparable with the sort of heavy-duty office system it's peddling, and anyway the BBC micro doesn't have networking built in. But what seems to hurt most is Acorn's apparent campaign against the papers it's advertising in.

'Acorn consider it essential that these publishers are kept fully informed because of their associated liability,' says Acorn blandly, and the company makes it quite clear that it reserves the right to take legal action should it feel it is necessary. The spokesman further explains that a paper knowingly publishing a faulty ad could find itself in just as hot water as the advertiser.

PCN's Glass Houses Department feels, like John Motson on Grandstand (August 25), that it's too early to reserve judgement.

REED WARBLER — Silver-Reed has wheeled out an addition to its ever-growing family of printers with the EXP400 daisywheel unit (bottom right). At a leisurely 12 cps it is a representative of the current Japanese trend that is bringing prices down as fast as it reduces print speeds. The EXP400 costs £250; it is compatible with the evergreen WordStar and includes bold printing, sub- and super-script, and underlining. Silver-Reed (0923 45976) helpfully points out that 12 cps is equivalent to typing at 120 words a minute.

Soft Projects adapts ace US games

American games for the Commodore 64 and other systems are to be increasingly available in the UK.

The Liverpool-based company, Software Projects, has signed licensing deals with Sierra On-Line, CVS Technology and Broderbund. The company is now selling BC's Quest for Tires and, not content with just importing American titles, is working on translations for other micros including the Spectrum.

This marks an important development in the transatlantic flow of software — to date companies such as US Gold have simply bought rights to market American games in the UK, but Software Projects is currently working on the conversion of titles such as CVS's arcade game Hunchback at the Olympics and Broderbund's Lode Runner.

A number of new games are under development and are due for release in November; these include Crypt Capers, Fatty Henry, Ledgeman, Karl's Kavern and a BBC utility Penguin Graphics. There will also be translations of games such as 'Jet Set Willy' and 'Manic Miner' for machines like the Amstrad and the MSX range. Other micros including the Oric, Vic 20 and Dragon will also be supported in the company's games range in the near future.

SOFTWARE

The new releases

Games

Spectrum: 'The greatest achievement in the history of home computing . . .' is how Bug-Byte describes it. What can it be: colour on a ZX81, a Commodore machine compatible with one of its predecessors? Put the trumpets away, it's merely a program conversion — Twin Kingdom Valley is now available on the Spectrum, with locations described in the halting tones of the Currah speech unit. The game will be in the shops by the middle of this month, priced at £7.95. To play 'rock's first adventure game' Aural Quest you'll have to buy a Stranglers album, but you don't need to play that. Aural Quest will come with every copy of Aural Sculpture. The Inferno, from Richard Shepherd Software (06286 63531), is a graphics adventure based on a long poem by some Italian geezer. It costs £6.50. PSS (0203 667556) has unleashed Frank N Stein for £5.95.

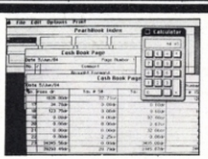
Commodore 64: Upper Gumtree is another Richard Shepherd offering, not based on a painting by Rolf Harris; it's an adventure set in a sleepy English village. The launch date is late September, the price £9.95 (£12.95 on disk). Creative Sparks (0252 543333) is releasing Danger Mouse in Double Trouble. The plot is roughly that you help secret agent Danger Mouse save the world — a snip for the world at £6.95.

Home/Educational

Commodore 64: Hewson Consultants (0273 693640) is joining forces with Longman to produce an exercise planning program called Shaping Up. At last, a use for those slimline disk drives you've been hanging on to.

Business

Spectrum: As a sequel to its highly-praised action-packed Stock Control, Kemp (01-444 5499) has released Purchase Ledger (incorporating nominal analysis). The program has space for 180 creditor accounts and 250 nominal accounts. It can be used with either cassette or Microdrive and costs £24.95.



A window on MacAccounting.

Macintosh: Peachtree Software (0628 32711) hopes to release MacLedger to follow MacCash in October in its MacAccounting series. MacPeachtree will charge £375 for the pair.

IBM: From the jolly blue giant itself comes news of three software packages for the PC: Multiplan 1.1 is a version with hard disk support as standard and extended memory, for £159 plus VAT; Pertmaster 1000 and 2500 are upgrades of the original Pertmaster, and they cost £646 and £845 respectively; and the ExecuVision Graphics Libraries store images on diskette for £63 to £69, again excluding VAT.

Various: Over 150 micros, says Tectonics (0638 669106), can run its turnkey systems covering accounting functions from a database with various frills. Sagesoft (091-284 7077) is more specific: its Payroll program will run on CP/M and MSDOS systems at a cost of £195.

Systems/Utilities

CP/M: Cobol-specialist Ryan-McFarland (0992 24981) has released version 2.0 of its RM/Cobol for machines running CP/M-86 and MP/M-86 — a prime feature is its cross-compiling facility, whereby the object code produced will run in any RM/Cobol runtime environment. Microft Technology (01-352 7876) is offering Menugen, a menu generator that will also run on MSDOS systems. It costs £34.50.

MSDOS: And PCDOS and compatible systems can now host UCSD Pascal, supplied by TDI (0272 742796). The company also supplies DOSFiler, a utility to let you read and write files interchangeably under MSDOS and the p-System.

PCN CHARTS

GAMES

NEW WEEKLY CHART! NEW WEEKLY CHART

			GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1	12	Décathlon	Activision	C64	£9.99
▶	2	2	Sabre Wulf	Ultimate	SP	£9.95
▶	3	1	Full Throttle	Micromega	SP	£6.95
▲	4	4	Match Point	Psion	SP	£7.95
▲	5	8	Beach-Head	US Gold	C64	£9.95
▲	6	7	Jet Set Willy	Soft Projects	SP	£5.95
▼	7	3	TLL	Vortex	SP	£5.95
▲	8	11	Micro Olympics	Database	SP, C64, AC	£6.95
▲	9	20	Decathlon	Ocean	SP, C64	£6.90
▼	10	9	Lords of Midnight	Beyond	SP	£9.95
▼	11	6	Arabian Nights	Interceptor	C64	£7.00
▲	12	—	Monty Mole	Gremlin	SP, C64	£5.95
▲	13	15	Mugsy	Melbourne	SP	£6.95
▼	14	10	Potty Pigeon	Gremlin	C64	£7.95
▼	15	14	Tank Duel	Real Time	SP	£5.50
▼	16	5	Jack & B'Stalk	Thor	SP	£5.95
▲	17	19	Loco	Alligata	C64	£7.95
▲	18	22	Stop the Express	Psion	SP	£5.90
▼	19	16	Psytron	Beyond	SP	£7.95
▼	20	17	Rapscallion	BugByte	SP	£6.95
▲	21	—	Strip Poker	US Gold	C64	£9.95
▼	22	18	Encounter	Novagen	C64, AT	£8.95
▶	23	23	Trashman	N Generation	SP, C64	£5.95
▲	24	—	Automania	Microgen	SP	£5.90
▲	25	28	Int Soccer	Commodore	C64	£9.95
▲	26	—	Olympicon	Hitech	SP	£6.95
▲	27	—	Code Name Mat	Amsoft/Micromega	SP, AM	£8.95
▼	28	27	Frak!	Aardvark	AC	£7.50
▼	29	21	War of the Worlds	CRL	SP	£5.95
▲	30	—	Collosal Adventure	Level 9	SP, C64, AC, LY	£6.90

MICROS

Top Ten over £1,000

TW	LW	MACHINE	PRICE	DISTRIBUTOR
▶1	1	IBM PC	£2,390	IBM
▶2	2	Apricot	£1,760	ACT
▲3	7	Compaq	£1,960	Compaq
▼4	3	Apple III	£2,755	Apple
▶5	5	Televideo TS1603	£2,640	TH
▲6	8	Wang Professional	£3,076	Wang
▼7	4	Sirius	£2,525	ACT
▲8	—	Kaypro	£1,604	Kaypro
▶9	9	Philips P2000 c	£1,484	MD,KDS
▲10	—	NCR Decision Mate V	£1,984	NCR

Top Ten up to £1,000

TW	LW	MACHINE	PRICE	DISTRIBUTOR
▶1	1	Spectrum	£99	Sinclair
▶2	2	Commodore 64	£199	CBM
▲3	5	BBC B	£399	Acorn
▶4	4	Vic 20	£140	CBM
▼5	3	Electron	£199	Acorn
▲6	7	Memotech 500	£250	MTX
▲7	—	Amstrad	£229	Amstrad
▲8	9	Oric	£99	Oric
▼9	8	Atari 800XL	£250	Atari
▶10	10	Dragon	£150	Dragon

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the week up to **August 23.** The games chart is updated every week.
Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT.
Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month.
PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.

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Programme:—

September

Monday 3rd Noon
— Grand Opening — by a tribe of Topo Robots (as seen on TV), supplied by Prism.

Tuesday 4th & Wednesday 5th
Demonstration of BBC, including Z80 and 6502 second processors — Torch disc pack — Teletext adapter — Digitiser — Gemini Datagem Database and Integrated business software.

Thursday 6th, Friday 7th & Saturday 8th
Demonstration of Memotech MTX, FDX disc drives, Solidisc, the incredible MRX graphics display using hard discs — RS128 — 128K version of MTX.

Monday 10th & Tuesday 11th
Commodore presentation — 64 Modem and Compunet — 1541 Express loader — Printers and Monitor — SX64 Portable and sneak previews of Plus 4 and Commodore 16!!!

Thursday 13th, Friday 14th & Saturday 15th
Prism will demonstrate the Sinclair QL and the Enterprise computers — also Spectrum and BBC Modems — Wren Portable computer.

Thoughout the exibitions there will be a continuous display of Microvitec colour monitors — for Sinclair QL . . . Spectrum . . . BBC . . .

Spend £10 or more and gain the chance to:

Win a Sinclair QL

Draw and presentation on Saturday 29th September

Special offers — available throughout the Festival:—

BBC 100K disc drives	£99.95 inc. VAT
BBC 400K D/S drives	£169.00
Spectrum 48K + £50 software	£127.95
Prism BBC and Spectrum Modems	Special Reductions
Memotech RS128 (RS232 + 128K)	£399.00
Smith Corona TPI D/Wheel — Serial	£199.95
80 Col Dot Matrix — 80 CPS	£199.95
Fuller FDS Keyboards	£44.95

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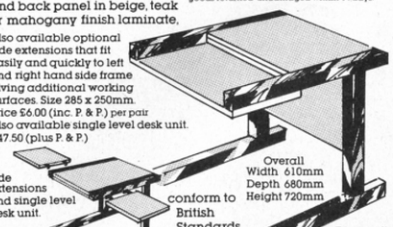

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Innovation info is patently obvious

Chris Rowley's *View from America* (issue 74) reported on RCA Corporation's recent US patent number 4,460,958 for a micro system. It may interest your readers to know that the inventors had also made application for a patent in the UK and, because of early publication requirements under UK patent law, the contents of US patent 4,460,958 were known in this country long before the US patent was granted and published. UK patent application GB 2 092 785A, complete with six pages of schematic drawings and nine pages of explanatory text, was published on 18 August 1982 — about 23 months before the US patent was published and, coincidentally, exactly two years before the cover date of *PCN* issue number 74.

Copies of UK patent specifications may be seen, free of charge, by any member of the public at the Science Reference Library in London and at public libraries in Birmingham, Glasgow, Leeds Liverpool, Manchester, Newcastle and Sheffield.

D E Walker,
Industrial Property Section,
The British Library, London WC2

Imagine this as a top-selling game

Ralph Bancroft should Imagine a bit harder (Monitor, issue 76). The Mersey Micro affair will be first and foremost a computer game. It will be written in Basic so that it runs as slowly as a mail-order firm.

PCN £10 Star Letter

Its box will have a multi-coloured inlay but the graphics will be as exciting as watching paint dry.

It will have more bugs than the insect house at the zoo — and it will get rave reviews in certain publications (not *PCN*).

And lastly, it will, of course, be a Megagame.

Andrew Turch
London NW11.

Three cheers for a caring supplier

I cannot be the only one to have experienced the results of responding to the Midwich Computer Company's advertisement for a Uchida 305 printer in issue 65 last June.

The machine arrived promptly, well packaged and good looking. It produced letter quality print at a quarter the speed of my Tandy LP5 and then suddenly went crazy. It began producing gibberish, then screwed up its ribbon and locked the print head solid.

I duly returned it under guarantee via Securicor for £15 and regretted having discarded the packaging. Midwich promptly sent me another without demur and I set it to work on the backlog. This time I kept the packing and . . . yes, Uchida II went the way of its predecessor. The woman at Securicor was thinking I would be a regular client.

I wrote a rather miffed sort of letter to Midwich this time, suggesting that a spot of hari-kiri would be in order back on the Uchida farm in Tokyo, and would they please credit me with £300 or so against a daisy that actually wheeled and kept on doing it. That got me an apologetic phone call from a Mr Keith Balding to explain that Uchida had released a batch with duff transistors. In true Bushido spirit, he promised to send me a good one and refund my financial support for Securicor, which he duly did.

Well done, Midwich. And three boos for Uchida. I can't really say third time lucky, although it does actually work. But it has some bad habits with the margins, so I am taking good care of the packaging. If this one has to go back, I suggest they drop it down a well and telex Tokyo for a Samurai persuader.

Gordon Millington,
Guildford, Surrey.

QL review rap: sack so-called experts

I have just finished reading your 'definitive QL review' in this week's issue. I really think you should sack your reviewers and give authors with more balanced opinions the job.

Most of the article was destructively critical and there was only occasional grudging lukewarm praise for the machine.

In the hardware section, Stuart Cooke seems obsessed with the keyboard and the non-standard sockets, and makes a sweeping conclusion that 'the QL does not live up to expectations' — an unfair comment after a largely irrelevant preceding section.

The software section contains no new information to speak of; and I presume 'atrociously slow screen I/O' really means 'slow Microdrive access', an undoubted problem with the word processor but one one which, I believe, has been helped by changes to the operating system in later versions of the QL ROM.

The SuperBasic review section is a mess. The author should know that concatenating strings uses the ampersand (&), not the "+", which is used only for numeric data. The paragraph headed Strings merely mentions three unimportant bugs. Of far greater importance is how SuperBasic handles string arrays, which I personally find confusing especially assigning to sliced strings. There is no mention of the interesting 'coercion' concept, which makes the VAL and STR$ functions unneccessary.

I own a first issue QL and of course it contains many bugs; but the fascinating Basic, the powerful MC68008 with its clear instruction set, and the free software plus a versatile and expandable computer that has a great future — make it amazing value, and it should not have received such a one-sided and thoughtless review, particularly from a respected magazine such as *PCN*.

Hugh O'Neal,
London SE24.

QL review rap: your view is flawed

Your QL review was misleading in several respects — your machine must be faulty.

I have owned my 'AH' version machine for ten weeks during which time both Microdrives have been 100 per cent reliable even after hours of the machine being turned on, which is more than I can say for floppy disks and cassette units I have used. You say that they are slow in operation, which is admittedly true in the case of *Quill*, but don't mention that new, faster versions of the software are due out in October. You also conveniently fail to mention that, because QDOS multi-tasks while DELETing or SAVing (with auto-verify) these operations are practically instantaneous and hence faster than any floppy disk will ever be. And what about the type-ahead buffer?

The picture quality on both my Ferguson TV and Microvitec 1451 Cub monitor is beyond reproach, so what sets were you using?

The Psion software is more user friendly and flexible than any of the so-called industry standards which I have used — nearly all such programs carry a 'Warning — this program may crash' message somewhere in the documentation if not in so few words: why give Psion such a hard time when, for the price of dBase II, you can buy a QL and four excellent programs, one of which is superior in many ways to dBase II?

You revel in pointing out obscure bugs in SuperBasic, but fail to point out the fast and extensive graphics commands and the fact that you can have 255 colours on screen at once using stipples.

I could go on — I could in fact rewrite your 'definitive' review in a completely different light without any exaggeration. It was not to the normal high standards of unbiased and informed opinion which I have come to expect.

John Lawlor,
Inverurie, Scotland.

We stand by our review. Even though a number or people may think the Sinclair QL is the best thing since sliced bread there are quite a lot more who are definitely disappointed with its performance. In the PCN *office we do have a number of machines passing through our hands each week and even though the QL does have a few nice points about it, the micro certainly falls way short of the standards set by other machines. We would also take issue with the 'corrections' in these two letters: we stand by our review.*

We have seen several QLs at PCN: none of them performed 100 per cent. — Ed.

Air your opinions, share your experiences or just point out our occasional blunders. If you have an impressive way with words you may gain £10 for the star letter.

WRITE TO: Random Access, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

Lost in a maze of bits and bytes, trapped in a forest of errors, bugged by Basic? Whatever the problem, CALL on us. Our panel of experts is at your command.

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Spectrum printer posers

Q I own a ZX Spectrum, and next year I may upgrade to a QL, but I'm currently faced with a printer problem.

I need a typewriter-cum-printer for my private letter writing, small business work plus some work printing from the computer. I have been looking at the Silver Reed EX44 and EX55 with memory and interface and the Brother CE51 and CE70 with memory and interface.

There is no technical guidance for selection available in Kuwait. Please advise me of your opinion, especially in view of the price difference between the two makes.

Are they compatible with the Spectrum?
J M Ali,
Ahmadi, Kuwait.

A The machines differ in price because they differ in sophistication. The Brother CE51 is a printer/typewriter, and differs from the earlier CE50 in that it already has the cable you need for it to operate as a computer printer fitted.

The CE70 resembles the CE51, but has been considerably upgraded. It has 8K memory built in (the CE51 doesn't have any) so you can perform limited text processing operations. It also has extra typing functions, and can be interfaced to a disk drive.

We'd rather not think about how you'd operate a Spectrum, CE70 and disk drive, bearing in mind that it's the CE70 that has the drive, not the Spectrum. If you wanted disks you'd be far better off getting some sort of system for the Spectrum.

As far as functions are concerned the EX44 and EX55 don't differ quite so much from one another. The 44 is sold as a portable printer/typewriter, whereas the 55 is more of a full office system. The EX55 has some extra functions, and though it doesn't have memory as such, it has a two-line correction memory.

Now we assume your requirements are as follows. You need a daisywheel typewriter that can be used as a printer for the Spectrum and for the QL, and while a daisywheel printer would be adequate for the QL you it's not really advisable to use the Spectrum keyboard for office work.

Any of the typewriters you suggest would fit the bill for the computer printer, so your decision must be based on the level of sophistication you need in an office machine. If you simply want a typewriter, go for the CE51 or the EX44, while if you want to be able to store and manipulate your text, go for the CE70.

The CE70 and the EX55 should be around the same price, and the CE70 is decidedly better value for money.

You might also like to consider the Brother HR15. This is a daisywheel printer, but you can get a keyboard for it, so you'll get a more flexible system for around the same price as the CE70.

As for interfacing, all these use an RS232 interface, which is fitted as standard on the QL. In order to use them with the Spectrum you'll need to buy yourself Interface 1 and a Sinclair cable.

Amstrad protection short-cuts

Q Is it possible to protect programs on the Amstrad CPC464 without using the ,P option when SAVEing them, and without using the ON BREAK command?
Christopher Johnson,
Northwich, Cheshire.

A Not really. The ,P option ensures that a program can only be RUN or CHAINed (which also RUNS the program). The only other way you could protect a program is to use KEY and KEY DEF to disable the ENTER keys so that once a program's running the user can stop it with two ESCapes, but can't do anything else.

KEY DEF 18,0,0,0,0 makes the large ENTER key generate nothing at all and KEY 139,"" disables the small ENTER key of the numeric keypad. To complete the ENTER disable you also have to KEY DEF 38,1,109,77,0 which means CTRL-M will not generate a carriage return either. (109 and 77 are the ASCII codes for lower and upper case 'm' respectively.)

Now, while a user may break into a program, there's no way they can LIST or do anything to the program, because they can't enter a command — none of the ENTER keys generate anything. However, all these definitions only occur once the program's started, so they don't really protect it at all — the 'breaker' can just LOAD and LIST your program.

Stick to ,P for reliable protection.

Padlocks beat the 64 programmable kind

Q I would like to be able to put a programmable lock on my Commodore 64 so that whenever I turn it on I would have to INPUT the correct password to be able to use it.

Can you print a listing that does this?
Trevor O'Grady,
Co Kerry, Ireland.

A No, and if you think about how a computer works you should be able to work out why. Computers have Read Only Memory and Random Access Memory — you can program the latter, but not the former, and anything you put into RAM is lost when you switch the power off.

When you power up your 64, the ROM takes over and goes through the same routines every time you switch it on. In order to do what you have in mind you have to change those routines, and you can't do this through software alone.

So if you want a password on your 64 badly enough this is what you do: first copy the ROM into RAM, then examine the 64's start-up routines. While the ROM is in RAM you can rewrite the start-up routines so that it demands an INPUT part-way through them. Once it does this to your satisfaction it's just a matter of blowing an EPROM and switching the 64's ROM for that EPROM.

Unless you're going to get into ROM disassemblies and EPROM programming in a big way it isn't really worth the bother. Life would be much easier if you just bought a lockable desk.

No such thing as a mag for beginners

Q I want a magazine that will help me learn a little bit more about computers from scratch, but *PCN* isn't quite like this. Could you please recommend such a magazine?
Joanne Eskdale,
Northumberland.

A Trying to learn about computers from magazines is a bit like going to the cinema without checking what time the film starts. You'll always find yourself in the middle of something, with no clear idea of the plot.

You can learn about computers from magazines if you read them for long enough, but you'll gain the knowledge in small, fairly random doses, and if it's a question of learning about computers in general rather than about one particular computer, it'll be that much more difficult.

The main exceptions to this will, of course, be the various computer partworks, but if you tot up the total amount of money you'd spend on the series it would work out as an expensive way to learn. One way to find out about computers is to buy a cheap one, because that's the easiest way to pick things up. The disadvantage here is that having got that far you could well decide you hate the beats, leaving you considerably out of pocket.

So what we'd suggest is that you attack the problem on two fronts. Buy a general book on computers and read that — it won't teach you how to use one, but it should give you a basic grounding in what they're all about. If you then feel you'd like to learn how to use one, try one of the Basic programming books available. *30 Hour Basic* is good, but errs on the textbook side, so you might have to work quite hard at it.

At the same time you should be taking steps to get as much time on a computer as possible. Use the school one if you can, badger clubs, twist friends' arms, etc.

Really get to know them well enough to know whether you want one, and then buy one, because when all's said and done that's the best way to learn.

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quad density 96tpi	747	26.99	24.99	557	32.99	30.99	MD2-DD	41.99	39.99
p&p per 10 disks		.75	FOC		.75	FOC		.75	FOC
8" diskettes	Code	1-9 boxes	10+ boxes	Code	1-9 boxes	10+ boxes	Code	1-9 boxes	10+ boxes
s'gle sided s'gle density	740.0	22.99	22.49	FD34-9000	25.99	24.79	FD1-128	26.09	25.49
s'gle sided d'ble density	741	29.99	29.09	FD34-8000	26.49	25.59	FD1-XD	29.09	28.49
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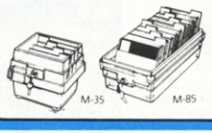

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SCIENCE

Physical Constants – Planck, electron mass, electron charge, Rydberg, Gravitation, Avogadro, speed of light, sound. Gas constant, permeability, permittivity, earth radius, Bohr radius, Astronomic unit, etc.
Conversion Factors – UK to MKS etc.
Formulae – LC circuit, Lenses, Bohr energy levels, Larmor, plasma, etc.
Integration Under a Curve
Least Square Fit
Solution of Polynomial Equations

UTILITY

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MATHEMATICS

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PSION

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Two Amstrad Basic peculiarities

The Amstrad CPC 464 has two unusual features in the Basic interpreter.

The first is the treatment of hexadecimal numbers as signed integers, causing PRINT &DDDDD to return −8739. This is not only annoying when printing out numbers, but causes errors in calculations and FOR . . . . NEXT loops, although PEEK and POKE are not affected.

To get round this problem you can use:

```
10 DEF FNhex(h)=-65536*
(h<Ø)
```

FNhex(h) then returns the corrected decimal value for h for calculations or printing *eg*:

```
PRINT FNhex(&DDDD)
56797
```

The same function returns correct values for binary numbers using the '&X' format.

The second peculiarity is in the PRINT formatting. Whenever an item is to be printed away from the edge of the screen, a spurious carriage return is generated if the item would otherwise overlap the right hand edge. For example, in Mode 1, where a$ is more than 2Ø characters long PRINT a$;a$ causes a$ to be printed on two successive lines, instead of the same line with overlap onto the second line.

For most print formatting purposes, where overlap onto a new line is undesirable anyway, this is unimportant (although ZONE, which defines the comma spacing, cannot usefully be set greater than half the screen width), but it is most annoying with LOCATE (the Amstrad's equivalent of PRINT AT): LOCATE 35,1Ø : PRINT "MISTAKE" will (in Mode 1) cause "MISTAKE" to be printed at the beginning of line 11, and this occurs even when the printed string consists of non-printing control characters. This can be avoided by using:

```
2... DEF FNLOKATE$ (x,y)
=CHR$ 31)+chr$ (x)
+CHR$ (y)
```

The above example can then be replaced by:

```
PRINT
FNLOKATE$)+"MISTAKE"
```

M D Barratt, Bournemouth.

Electron/BBC errors listed here

When programming on the BBC it is sometimes useful to be able to insert commands such as LIST and DELETE. But this results in a syntax error message.

There is a way of inserting the commands using a *FX call: *FX 138,Ø,X.

As an example the following program will list itself:

```
1Ø *FX 138,Ø,76
2Ø *FX 138,Ø,46
3Ø *FX 138,Ø,13
```

It works by inserting 'L' and '.' into the keyboard buffer followed by a carriage return.

I have used this to develop an error trapping procedure. Place it at the end of the program and include the line ON ERROR PROC-error near the start of the program. If the procedure is called, it explains what has happened and lists the offending line.

It works by taking the line number, converting it into a string and then one by one inserting each character into the keyboard. It was written for the Electron, but will work on the BBC. However, due to the use of OSCLI it will only work with Basic II machines.

```
  5 ON ERROR PROCERROR
  1Ø  PRINT ME
  2Ø END
3ØØØ DEF PROCERROR
3Ø1ØREPORT
3Ø2ØPRINT" at line ";ERL
3Ø3ØREM FLUSH
3Ø4Ø*FX 21,Ø
3Ø5Ø*FX 138,Ø,76
3Ø7Ø*FX 138,Ø,46
3Ø9Ø$=STR$(ERL)
31ØØFOR X=1 TO LEN(E$)
3110PART$=MID$(E$,X,1)
3120E=ASC(PART$)
3130OSCLI"FX"+STR$138+",
"+STR $Ø+","+STR$E
3140NEXT
3150*FX138,Ø,13
3160END
```

Stephen Baker, St George, Bristol.

No more NO ROOM messages on the BBC

The four pseudo-variables HIMEM, LOMEM, TOP and PAGE give the BBC user information on the available memory allocation. So the user program size is (TOP-PAGE and the screen memory extends from HIMEM to &7FFF. LOMEM defines the bottom of 'spare' RAM and is usually the same as PAGE.

The problem is that the 'spare' RAM given by (HIMEM-LOMEM) is partially occupied by the variables and hence is not truly spare.

The pointer to the address where the next variable is to be stored is stored in zero page locations 1 and 2 in high byte, low byte format.

Therefore the amount of RAM used by the variables is given by (256*?1+?2)−LOMEM and the truly free RAM is given by HIMEM−(256*?1+?2).

Note that since variables are assigned as they are encountered in the program, this computation is only valid if the whole program is run first.

It then shows how much space is available for program expansion or additional variable declarations.

David Abbott, Horsham, Sussex.

Spectrum debugging with variable results

The subroutine below is a debugging aid that traces the path taken through a Spectrum Basic program and prints the content of any variable.

Add the instruction GOSUB 9995 to the program lines to be debugged and RUN your program. Whenever the subroutine is called, the line and statement number from which the call is made will be printed at the bottom of the screen and the program will PAUSE. Press any key (except Break) to single step through each line containing GOSUB 9995, or press 'P' if you wish to print the content of the variable.

When printing the content of variables, you may use many of the Spectrum variable handling functions. A few examples are:

```
A$
A$(5 TO 9)
PEEK 23635 + 256 * PEEK 23636
INT((PEEK 23609)/6
BIN 11111100 (this will return the decimal equivalent).
```

Note the use of that mysterious VAL$ function in line 9998 of the subroutine. If you make a mistake when entering the variable(s) and get the error message 'Nonsense in Basic', re-enter the subroutine with the direct command GOTO 9997. If you Break out of the subroutine, you will have to enter CLOSE#2.

In the subroutine, PEEK 23613/4 gives the ERR SP address from which point the GOSUB stack can be referenced to obtain the RETURN line and statement numbers. POKE 23692,1 prevents the line and statement numbers being scrolled up the screen and OPEN#2,'k' opens the channel for printing to the lower screen.

If your program already uses the string variable p$, you will have to use another variable name in the subroutine. After printing variables, return to the main program by just pressing Enter in response to the 'Variable ?' prompt.

DPJ Brown, Innsworth, Gloucester

```
9995 LET trace=PEEK 23613+256*PE
EK 23614: POKE 23692,1: LET trac
ex=PEEK (trace+2)+256*PEEK (trac
e+3): LET tracez=PEEK (trace+4)-
1: OPEN #2,"K": PRINT AT Ø,Ø;tra
cex;" ";tracez;"                ": PAUSE Ø:
IF INKEY$="P" OR INKEY$="P" THEN
 GO SUB 9997
9996 CLOSE #2: RETURN
9997 INPUT AT Ø,Ø;(tracex);" ";(
tracez);"  Variable? "; LINE p$:
 IF p$="" THEN PRINT AT Ø,Ø;"
                ": RE
TURN
9998 PRINT AT Ø,Ø;tracex;" ";tra
cez;"  ";p$;"=";: IF LEN p$>=2 T
HEN IF p$(2)="$" THEN PRINT """"
;VAL$ p$;"""": PAUSE Ø: GO TO 99
97
9999 PRINT VAL p$: PAUSE Ø: GO T
O 9997
```

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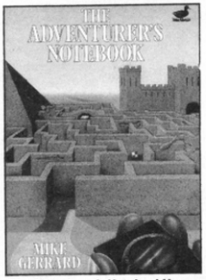


'The Adventurer's Notebook' by Mike Gerrard, published by Duckworth at £3.95 (paperback, 123 pages).

Mike Gerrard, known to most of our readers as the author of the PCN Adventures column, has produced the ideal tool for adventure addicts.

Throw away all those messy bits of paper. Here you have a scrapbook with pre-drawn map templates to keep all that vital information at our fingertips.

The 'fill it in as you go along' section makes up more than half the book: 78 pages to be precise. It consists of blank tables with columns marked Location, Objects Found, Action Tried and Result, as well as the pages and pages of squares that make up the map templates.

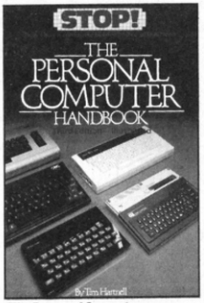
The rest of the book is made up of an introduction to adventuring, some hints and general advice, a history of adventures and three appendices.

The hints section is aimed at both the beginner and the seasoned player. Sprinkled with a liberal helping of examples from a variety of games, the various pitfalls and tricks that can overcome them are described.

Adventures tell a story, in much the same way that storytellers of yore did — or so Mr Gerrard would have us believe. He also sees the role-playing games such as Dungeons and Dragons as a major influence on computer adventures.

The appendices contain Mr Gerrard's recommendations as to which adventures are worth playing, a list of useful addresses (of software houses) and a glossary of synonyms for when you get stuck for words. My main criticism of the book is the limited range of adventures mentioned in the recommended section. A table of adventures with some kind of rating would have been more useful, and why on earth aren't Apple games mentioned at all? Some of the first adventure implementations were on an Apple.

Apart from this minor gripe, it is an excellent book which will make any ardent adventurer's life a lot easier. **LB**



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Here at last is an eminently readable, yet in-depth guide to the fast-growing personal computer marketplace for novices and technocrats alike.

This is by no means computer journalist Tim Hartnell's first offering in what is now becoming a crowded sector of the publishing industry.

For the personal computer shopper this is probably one of the better books around today. Talking potential customers through the maze of brands, cost, functions and, more importantly, specifications in an easy-to-read and lucid style, Mr Hartnell gives some handy tips on what exactly to look for — be it for personal or hobbyist purposes.

The Personal Computer Handbook though is more than simply a buyer's guide. It features a history of the personal computer with a neat summary of the rise of Clive Sinclair, among other things, as well as sections on programs and user groups. **COG**

'Getting the most from your Lynx' by Steven Jedowski, published by Penguin at £5.95 (paperback 128 pages).

Getting the most from your Lynx, apart from being a shaggy cat story, is not bad. After it starts out rather simply, it gets down to introducing the Basic and gives you a few ideas for programs to write, such as a compound interest evaluation routine.

Following this introductory session, there is a section on how the computer works. This uses those examples that use a light bulb to show how binary

works (click on, click off). I suppose that this is the definitive method but it would be nice if somebody could come up with something a little more original. The author then gives you more about Basic — and yet more about Basic. Then comes the pretty bit with the pictures: Graphics and Sound. In the centre of this section are four pages of screen shots. These are very cute, showing the good old Jack of the Union, a bit of Moire fringing, and some pictures that are just downright clever.

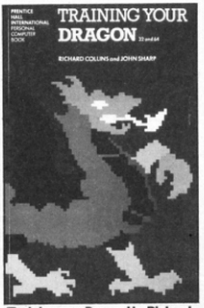
Unfortunately, there are no details on how these were produced. There are then a few pages on sound.

After a few comments about add-ons, the author gets back to Basic to cover a few of the more obsucure aspects, such as REPEAT UNTIL, Procedures, and WHILE WEND.

Then, the book gets down to getting the most from the machine, with a few hints and tips about the alternative green, moving the display up and down, and olding accidentally newed programs. An interesting section is that on loading cassette programs. Apparently, Lynx problems tend to be caused by phase inversion, the solution being to reverse the connections of the cassette lead (signal for ground). This is the one thing that I have never tried but if it works, whoopee.

Finally, there is a brief comment on the larger versions of the machine and what they are capable of, CP/M etc.

Overall, for £5.95, the book does not really provide more than the manual that comes with the machine. It is also rather quiet about getting the most from your system. The Lynx is actually quite a flexible piece of kit with some nice aspects, if only somebody could write something that mentioned these. **KG**



'Training your Dragon' by Richard Collins and John Sharp, published by Prentice Hall at £7.95 (paperback, 297 pages).

Here is a book devoted to elementary Dragon programming and as such it succeeds — more or less. The text is wordy, but at least this avoids ambiguity. There are 25 chapters, the index is comprehensive, but the chapter on peek and poke could have been far more comprehensive: no useful ROM calls are listed and the chapter (which includes the sum total of information on machine code) only runs to 14 pages.

The book's detail is tremendous, but overwhelming. It takes the authors so long to spell out what they're trying to say, that all too often you lose track of what the topic is. There are too many throwaway lines like the one towards the end of the chapter on arrays: 'You should be able to see that this makes any searching or accessing easy since it can all be done by indexing'. True, but indexing is not explained, and only seven are allotted to arrays which, we are told: 'are such useful programming tools'.

This is an overpriced, overdetailed introduction to extended Microsoft Basic and you'd do better to spend £7.95 on more concise texts. **BS**

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If you're having trouble programming arrays in your Spectrum adventures, let Kenn Garroch show you the way.

Arrayed for action

Initially arrays can be confusing, but once you grasp the idea it's clear that they're both useful and logical. The easiest way to visualise an array is to think of it as a table, so by saying DIM a (10,12) you're DIMensioning an array of ten characters by 12. All you're doing, in fact, is drawing up a 10×12 table of empty boxes, and reserving the right to fill it with numbers later.

Arrays, both numeric and string, tend to be an important element of adventure programming, and this provides a good illustration of how they operate. But the standard adventure displays only half of the array's potential. Normally, adventures come with the arrays already filled with details. You can, however, design an adventure that allows you to fill in the location descriptions before you actually play it.

Arrays allow you to negotiate a sort of maze, picking up pieces of gold and confronting various monsters. Let's see how to write a program that allows you to define the rooms and passageways and wander around them.

Trade-off

The best way to start the program design is to work out what arrays will be needed.

Since the program needs a set of descriptions for the rooms etc, you need a string array to hold these. The total number of locations possible is set by the amount of memory you have available. In the program that follows, this is set to 10 using the variable M, and can be increased until the memory runs out. The length of the description string is set with T, which can also be increased, but eats up large quantities of memory. The trade-off is between many locations with short descriptions, or a few with more details.

To use the description array, you need a set of pointers to allow the rooms to be linked together in various ways. You must also set the pointer array to default values. Section 1 of the program does just this.

The next thing to do is to set out some kind of control for the program. This is the main menu and gives the options to edit the descriptions, load and save definitions, link up the rooms in a random way and play the game. This is dealt with by Section 2 of the program.

The end option is relatively easy. To make sure you don't come out of the program without saving the data, it is generally a good idea to ask before doing something as drastic as stopping. This is dealt with by Section 3.

The next sections are the major parts of the program. Let's take the editor first. This is again controlled from a menu which provides all the major options for defining a series of locations. Section 4, the menu, is written in exactly the same way as the main menu.

Taking these options in order, Section 5 is a routine to list the locations that have, or haven't, been defined. Obviously, if there are several locations it's a good idea to allow some kind of escape mechanism to get back to the previous menu.

One of the clever things about the Spectrum's Basic is its ability to perform the print statement in line 366, allowing the exits to be printed only if they have been specified by putting a zero in the 'E' array.

This direction specification is performed in the edit location section that follows (Section 6). This just asks for the location number and then expects a set of exit directions — which are 'north', 'south', 'east', and 'west'.

Directions such as 'up' and 'down' etc can be added by changing the DIM in line 25 and 30 to allow space in the E and S arrays.

After entering information, you don't need to use it all. Section 7 checks the entries and puts them in the correct positions on the 'E' array, North being E (T,1), South being E (T,2) and East and West being 3 and 4 respectively. Using this routine allows the exits to be entered in the wrong order without confusing the program.

Once all the locations have been defined and described they need to be attached to each other. Normally an adventure will have these predefined as part of the game. Since this is a simple adventure and contains no movable objects, we have to make it exciting somehow. This is done by allowing locations to be attached randomly to each other, but making sure that if you exit south then you must enter north, as in Section 8.

The juggler routine is split into three main parts. The first is a subroutine that resets the original directions into the E array (subroutine 1060). The juggler then goes through the locations and checks whether they have any valid exits. If they contain 0, an exit, the routine jumps down to line 520 and roots through 100 random locations until one is found that fits the bill of matching North to South, East to West, etc. The location numbers are then swapped over in the E array, making a connection (see Section 9).

Ready to go

The next major section of the program, Section 10, allows the adventure to be run. First the description of location 1 is displayed and then the exists are given. After entering the direction to be followed, lines 640 and 650 work out whether the direction is valid or whether it has not been assigned. Line 680 assigns the new location number to L, the current position.

The other options are L, which reprints the current description, and F, which allows you to get back to the main menu. Again, to make the program as idiot-proof as possible, it is a good idea to ask if the player wants to end with Section 11.

The final subroutines, Section 12, are generally concerned with data handling, and allow the main game array to be saved and loaded from tape or from Microdrive.

Since the juggler program alters the E

array, to rejuggle the program, the directions need to be saved somewhere. Section 13 loads and saves the E array in the S array (S for save).

And that's it. You can probably think of hundreds of improvements to this, and it has been written in such a way as to allow these to be entered with ease.

The art of using the program to define a good adventure is to make the locations interesting enough that they stand up on their own. If you want to provide monsters simply enter a description such as: 'You stand in a dank, dark closet. From the corner comes a piercing shriek which dies away into a whimpering moan. Cobwebs brush your face.' And the rest is up to you...

PCN

Section 1

```
6 BORDER
7 INK 3
8 LET T=30
10 LET m=10
20 DIM d$(m,T)
25 DIM s(m,4)
30 DIM e(m,4)
31 LET b$="no"
35 FOR t=1 TO m: FOR s=1 TO 4:LET e(t,s)=-1:NEXTs :NEXT t
```

Section 2

```
40 CLS
45 DEF FN R(r)=INT(RND*r)+1
50 PRINT "   Simple Adventure"
60 PRINT
70 PRINT " 1...Play"
80 PRINT " 2...Editor"
90 PRINT " 3...Load"
100 PRINT " 4...Save"
110 PRINT " 5...Randomise"
115 PRINT " 6...End"
120 LET a$=INKEY$:IF a$="" THEN GOTO 120
130 IF a$="1" THEN GOSUB 600:GOTO 40
140 IF a$="2" THEN GOSUB 230:GOTO 40
150 IF a$="3" THEN GOSUB 900:GOTO 40
160 IF a$="4" THEN GOSUB 800:GOTO 40
170 IF a$="5" THEN GOSUB 450:GOTO 40
180 IF a$="6" THEN GOSUB 200:GOTO 40
190 GOTO 120
```

Section 3

```
200 INPUT "Are you sure "ib$
210 IF b$="yes" THEN STOP
220 RETURN
```

Section 4

```
225 REM This is the editor
230 CLS
240 PRINT "   Editor menu"
250 PRINT
260 PRINT " 1...List locations"
270 PRINT " 2...Edit Location"
280 PRINT " 3...Main menu"
290 LET a$=INKEY$
300 IF a$="1" THEN GOSUB 340:GOTO 230
310 IF a$="2" THEN GOSUB 410:GOTO 230
320 IF a$="3" THEN GOSUB 1000:RETURN
330 GOTO 290
```

Section 5

```
335 REM list locations
340 PRINT "Hit 's' to stop"
350 FOR t=1 TO m
360 PRINT t;"==>";d$(t)
375 PRINT "Exits are ";
366 FOR s=1 TO 4:PRINT ("North " AND e(t,s)=0 AND
s=1);("South " AND e(t,s)=0 AND s=2);("East " AND
e(t,s)=0 AND s=3);("West" AND e(t,s)=0 AND s=4);
:NEXT s
367 PRINT
370 LET a$=INKEY$
380 IF a$="s" THEN LET t=m
390 NEXT t
400 RETURN
```

Section 6

```
405 REM Edit location
410 INPUT"Enter location to edit ";L
420 PRINT d$(L)
430 INPUT"==>";d$(L)
431 INPUT "Enter exits n/s/e/w ";a$
432 FOR t=1 to 4
433 FOR s=1 TO LEN a$
434 LET e(L,t)=((a$(s TO s)="n") AND t=1)+((a$(s TO
s)="s") AND t=2)+((a$(s TO s)="e") AND t=3)+((a$(s TO
s)="w") AND t=4)-1
435 IF e(L,t)=0 THEN LET s=5
437 NEXT s:NEXT t
440 RETURN
```

Section 7

```
444 REM juggler
450 GOSUB 1060
455 FOR t=1 TO m
460 FOR s=1 TO 4
470 IF e(t,s)=-1 THEN GOTO 500
480 IF e(t,s)<>0 THEN GOTO 500
490 GOSUB 520
500 NEXT s
```

Section 8

```
515 REM swap exits
520 FOR u=1 TO 100
530 LET v=FN R(m)
540 IF (s=1 AND e(v,2)<>0 ) OR (s=2 AND e(v,1)<>0) OR
(s=3 AND e(v,4)<>0) OR (s=4 AND e(v,3)<>0) THEN
GOTO 570
550 LET e(t,s)=v:LET u=100
570 NEXT u
580 RETURN
```

Section 9

```
599 REM Main game
600 LET L=1
605 LET PRINT d$(L)
620 PRINT "Exits are ";("North" AND e(L,1)<>-1);("
South" AND e(L,2)<>-1;(" East" AND e(L,3)<>-1);("
West" AND e(L,4)<>-1)
625 PRINT a$"                                    "  .
630 INPUT "Which way "ia$
635 LET a$=a$(1 TO 1)
640 IF (a$="n" AND e(L,1)=-1) OR (a$="s" AND e(L,2)=-
1) OR (a$="e" AND e(L,3)=-1) OR (a$="w" AND e(L,4)=-1)
THEN PRINT"Sorry, you can't go that way":GOTO 620
650 IF (a$="n" AND e(L,1)=0) OR (a$="s" AND e(L,2)=0)
OR (a$="e" AND e(L,3)=0) OR (a$="w" AND e(L,4)=0) THEN
PRINT "Mmmm you seem to be in the      wilderness,
you'd best go back":GOTO 610
660 IF a$="f" THEN GOSUB 700
670 IF b$="yes" THEN RETURN
680 IF a$="l" THEN GOTO 610
690 LET
L=((a$="n")*e(L,1))+((a$="s")*e(L,2))+((a$="e")*e(L,3)
)+((a$="w")*e(L,4))
695 IF L=0 THEN PRINT "Eh ??":LET L=0
696 GOTO 610
700 INPUT "Are you sure "ib$
710 RETURN
```

Section 10

```
799 REM save d$() e() s()
800 CLS
810 INPUT "Enter adventure file name "if$
815 SAVE *"m";1;if$+"s" DATA s()
820 SAVE *"m";1;if$+"d" DATA d$()
830 SAVE *"m";1;if$+"p" DATA e()
840 RETURN
```

Section 11

```
899 REM Load d$() e() s()
900 INPUT "Enter file name "if$
910 LOAD *"m";1;if$+"p" DATA e()
915 LOAD *"m";1;if$+"d" DATA d$()
920 LOAD *"m";1;if$+"s" DATA s()
930 RETURN
```

Section 12

```
999 REM Store original directions
1000 FOR t=1 TO m
1010 FOR s=1 TO 4
1020 LET s(t,s)=e(t,s)
1030 NEXT s
1040 NEXT t
1050 RETURN
```

Section 13

```
1059 REM Retrieve original directions
1060 FOR t=1 TO m
1070 FOR s=1 TO 4
1080 LET e(t,s)=s(t,s)
1090 NEXT s
1100 NEXT t
1110 RETURN
```

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Scroll the Amstrad screen display with Clare Gurton's simple machine code routines.

Amstrad scrollwork

It's often useful to scroll a computer's screen display up or down, particularly in games. On most machines you can scroll the screen up a line by printing in the last screen cell, but there's no way you can reverse the process to scroll the screen downwards.

Of course, it's possible to write machine code routines to shift the screen display about according to your needs, but this means getting to grips with assembly language programming, and most of us would rather steer clear of that.

Fortunately, the Amstrad ROM is so well-documented that it's possible to write very simple machine code routines which call up ROM routines to do such complex tasks.

For example, there's a ROM routine called SCR HW ROLL at &BD4C (50395 decimal) which uses the Amstrad's hardware to scroll the screen up or down, depending on the contents of the B register. The ROM routine moves the screen by eight pixel lines (one character row) at a time, and fills the new top or bottom row with the colour given by the ink code of the contents of the A register. If the contents of the B register is zero, the screen scrolls downwards, and any non-zero value forces an upwards scroll.

There are two simple ways of using the ROM routine. Either you can set up a single routine which you have to change by one byte (via a POKE) before calling it, or you can set up two routines, one for up, the other for down, and that's the first method shown here.

Each routine will first load the B register with the relevant value — 255 for up, 0 for down — then call the ROM routine and finally return to Basic. Loading the B register uses the mnemonic LD B, n (where n is a number between 0 and 255). The op-code for LD B is 06, so this will be the first byte of each of the assembled routines. For the down-scroll routine the next number will be zero, while the up-scroll routine will need any non-zero value — FF (255 decimal) will do.

Calling the ROM routine requires the mnemonic CALL nn, op-code C9, 205 decimal. The ROM routine begins at &BC4D (50395 decimal) and, because the Z80 works on the low byte, high byte principle for referring to 16-bit addresses, we'll need to follow the CALL with 4D (77 decimal) then BC (188 decimal). Finally, the routines must return to Basic via the mnemonic RET, op-code CD, 201 decimal.

The Basic loader for the two routines is given in Figure 1. You can RUN this, then delete it before entering a program which uses scrolling. You'll have to set memory to 43879 to preserve the routines from corruption by Basic programs and their data.

The routines are assembled from 43880 and to use them you just call the relevant addresses. CALL 43880 will scroll the screen up, while CALL 43886 will perform a downwards scroll. You may find it easier to set up two variables such as: down. scroll = 43880; then use CALL up. scroll and CALL down. scroll. Figure 3 demonstrates how to use the routines like this.

Figure 4 gives the details of a rather more complex, single machine code routine which will reperatedly call SCR HW ROLL according to the contents of address 43871. As given, the routine uses an ink value of zero and scrolls the screen up by ten lines.

You can alter any of these by POKEs to the relevant addresses. You can POKE 43877 with 0 for a down scroll, 255 for up, while the ink colour for the newly created top or bottom line is held in 43873. So, if you wanted the screen to scroll up ten times you'd POKE 43877, 255: POKE 43871, 10: CALL 43870. The last listing (Figure 5) is the Basic loader for the routine.

This routine uses the B register as a sort of loop counter. The routine begins by loading the B register with the contents of address 43871, which is why you have to poke this address with an eight bit number (<=255) for the number of lines to scroll.

Next, the colour for the blank line which will be created by a scroll in either direction is loaded into the A register. Both A and B have to be PUSHed onto the stack before calling the ROM routine because it corrupts all the register pairs. The last action before calling SCR HW ROLL is to load the B register with the direction in which to scroll the screen.

When the ROM routine returns, the AF and BC register pairs have to be restored (POPed) for the next operation. This is the Z80 instruction DJNZ — decrement and jump on non-zero. This subtracts one from the B register and jumps according to the displacement (two's complement) in the next byte if the new content of the B register is not zero. When the DJNZ operation results in zero, the zero flag is set, the test fails and the routine ends in RET, passing control back to Basic.

Ideally, you'd use an assembler to work out the displacement for you, but until one is available for the Amstrad you'll just have to hand-assemble awkward details like this.

In this example the program flow needs to be directed back to address 43874, which is nine bytes back from the address of the DJNZ instruction. However, you have to add 2 to this value, because the program counter (PC) will be pointing to two bytes on from the DJNZ instruction by the time the decrement etc has been done. This means you want a negative jump of 11 bytes.

To translate a negative decimal number like −11 into its two's complement, write down the binary pattern (00001011), rewrite it with all noughts replaced with ones and vice versa (11110100). Then add one to the binary pattern (11110101) and finally convert to decimal (245) which is the value you put at address 43884 as the negative displacement for the DJNZ instruction.

Figure 5 also gives demonstrations of the routines. You'll find that altering the value contained in the A register results in some interesting coloured textures.

PCN

Figure 1: Basic loader for the two routines

```
10 REM up.scroll
20 MEMORY 43879:address = 43879
30 DATA 06,255,205,77,188,201
40 FOR count = 1 to 6
50 READ value
60 POKE address + count,value
70 NEXT
80 REM down.scroll
90 address = 43885
100 DATA 06,0,205,77,188,201
110 FOR count = 1 TO 6
120 READ value
130 POKE address + count,value
140 NEXT
```

Figure 2: Addresses, mnemonics, op-codes/data and decimal values

Address	Mnemonic	Op-code/Data	Decimal
43880	LD B,FF	Ø6	6
43881		FF	255
43882	CALL &BC4D	C9	205
43883		4D	77
43884		BC	188
43885	RET	CD	201
43886	LD B,ØØ	Ø6	6
43887		ØØ	Ø
43888	CALL &BC4D	C9	205
43889		4D	77
43990		BC	188
43991	RET	CD	201

Figure 3: Demonstration of routines

```
1Ø MEMORY 43879
2Ø up.scroll=43880:down.scroll=43886
3Ø WHILE A$ = ""
4Ø FOR up = 1 TO 1Ø
5Ø CALL up.scroll
6Ø NEXT
7Ø FOR down = 1 TO 1Ø
8Ø CALL down.scroll
9Ø NEXT
1ØØ A$ = INKEY$
11Ø WEND
```

Figure 4: Multiple scrolls

Address	Mnemonic	Op-code/Data	Decimal
43870	LD B,A	Ø6	6
43871		A	10
43872	LD A,Ø	3E	62
43873		Ø	Ø
43874	PUSH BC	C5	197
43875	PUSH AF	F5	245
43876	LD B,FF	Ø6	6
43877		FF	255
43878	CALL &BC4D	CD	205
43879		4D	77
43880		BC	188
43881	POP AF	F1	241
43882	POP BC	C1	193
43883	DJNZ	1Ø	16
43884		F5	245
43885	RET	C9	201

Figure 5: Basic loader for complex routine

```
1Ø MEMORY   43869
2Ø address = 43869
3Ø scroll = 43870
4Ø DATA 6,1Ø,62,Ø,197,245,6,
   255,205,77
5Ø DATA 188,241,193,16,245,201
6Ø FOR count = 1 TO 16
7Ø READ value
8Ø POKE address + count,value
9Ø NEXT
1ØØ '
11Ø ' 43873 is colour of new
   line
12Ø ' 43871 is number of scroll
   lines
13Ø ' 43877 is up/down
14Ø '
15Ø REM Demonstrations
16Ø GOSUB 21Ø
17Ø POKE 43871,1Ø
18Ø GOSUB 3ØØ
19Ø END
2ØØ ' Demo One
21Ø FOR no.lines = 1 TO 2Ø
22Ø POKE 43871,no.lines
23Ø POKE 43877,Ø
24Ø CALL scroll
25Ø POKE 43877,255
26Ø CALL scroll
27Ø NEXT
28Ø RETURN
29Ø 'Demo Two
3ØØ FOR colour = 1 TO 255
31Ø POKE 43877,Ø
32Ø CALL scroll
33Ø POKE 43877,255
34Ø CALL scroll
35Ø POKE 43873,colour
36Ø NEXT
37Ø RETURN
```

PCN PRO-TEST
HARDWARE

Another micro for the computing novice has emerged from Commodore. Barry Miles welcomes it with open arms.

SWEET SIXTEEN

The circuit board inside the C16 has been greatly reduced compared to those of the Vic 20 and the Commodore 64 which used to fill the whole case.

The Commodore 16 is a replacement for the ageing but immensely successful Vic 20. It has the same price tag, but more features to offer the microcomputing novice. The buyer's £139.95 gets the machine, four pieces of software, a cassette unit and *Introduction to Basic part 1*.

The Commodore 16 has 16K of RAM and 32K of ROM which covers the operating system and Basic interpreter. Graphics are well catered for. There are high-resolution graphics, multi-colour graphics, a split screen offering text and high-resolution or multi-colour graphics. As on the 64, the display is 40-column and the graphics resolution is 320×200.

The two sound generators included on the machine are for musical tones and for white noise.

Curiously, while the Basic is superior to the 64's, Commodore has ignored sprites. It was sprites that offered the beginner programmer the opportunity to design and implement some form of game, for all that the sprites worked slowly in Basic.

Commodore delights in creating new market slots at different levels for its various products, and ignores compatibility between various models. This approach has been maintained on the 16. But, in a sense, since this is intended for beginners there is no need to maintain compatibility of keyboard design or interfacing sockets.

First impressions

The machine's dark brown case resembles a 64 or a Vic 20 until you notice the cursor keys have doubled in number to four cursor keys and an Escape key. A Help key has replaced one of the function keys. The rear of the machine holds the memory expansion port — it looks similar to the Commodore 64's, but 64 cartridges and add-ons will probably not work.

The TV and monitor connections are the same as on earlier machines, as is the serial output port for connection to Commodore's own serial products. However, the cassette connection is different so using the supplied cassette recorder is obligatory.

The joystick connection has also been changed — only Commodore's own new 'improved advanced joysticks' will fit the bill.

The list of peripherals which work with the C16 is quite long. In addition to the 1541 disk drive, the 1526 dot matrix printer and the 1520 plotter, are such attractive newcomers as:

- SFS481 fast disk drive. (An interesting model, which unfortunately doesn't run with the Commodore 64, but does make the 16 and Plus/4 altogether more attractive),
- MCS 601 colour dot matrix printer,
- MPS 802 dot matrix printer,
- DPS 1101 daisy wheel printer,
- C1703 colour monitor.

These are designed to match the new computers, both electronically and in appearance.

The Reset button is a new departure. The way it is implemented is highly attractive as will become clear later.

Documentation

Only preliminary documentation was available for the review. This was adequate — perhaps Commodore, learning from past experience, is going to produce some improved documentation.

Although the manual was preproduction it was well written, with an overall view of the machine and a detailed section which lists all the keywords with full explanations. Memory maps are provided and full details of how the machine code monitor works — yes, there is a monitor in this machine which will please would-be machine code programmers.

Construction

The 16 seems reasonably well built. The keyboard is pleasant to use and raked at an

angle which most typists will like to use.

It is quite apparent that Commodore has paid great attention to past criticisms levelled at them. Every effort seems to have been made to make the machine easy to program. First, the Help key locates the error which caused your Basic program to stop. Second, the Function keys are no longer blank on power-up, requiring you to find out how to program them — details which were hidden away in the reference manual for the 64. The machine comes with sensible defaults preprogrammed on to the keys, and the Basic has a command which enables you to reprogram them easily. See Table 1 for function key defaults.

The keys can be redefined from within a program as well as in Direct Mode. This is convenient because you can have a set of key definitions in files on disk and run a program to redefine keys as you go about various tasks.

The rear of the machine holds most of the expansion sockets. The monitor, Disk/Printer and expansion sockets are the same as those on the 64. The cassette socket has been altered to suit the cassette recorder provided.

The inclusion of a reset switch on the C16 is a new venture for Commodore. You can now reset your machine without having to buy add on switches. Note the new style joystick connectors.

Table 1:
Function key default details

F1: enters one of the Graphics modes of operation.

F2: prints DLOAD", followed by inverted commas, so you can type in just the filename and hit Return to load from disk.

F3: lists the directory without disturbing the program in memory.

F4: clears the screen, even if you are currently in one of the Graphics modes.

F5: prints DSAVE", followed by inverted commas, leaving you merely to add the filename.

F6: runs the program, which is in memory.

F7: lists the current program.

F8: this is the Help key. It causes the line in which an error has occurred in a Basic program to be listed, and the errors to be highlighted in print which flashes on and off.

The Escape key implements a considerable range of additional functions, which increase further its programming attraction. (See Table 2.)

The Control key also has a number of functions to perform. Control plus a colour key selects colours indicated on the upper set of markings on the colour (numeric) keys.

Listing or printing to the screen can be paused by pressing Control plus 'S'. Any other key restarts printing. Control is also used to put reverse field and flashing into and out of operation. The Flashing command causes subsequent letters to flash on and off until you type Control and Flash/Off, Return, or Escape.

The Commodore Logo key picks the graphics mode you want. It also selects from the additional range of colours available according to the lower set of markings on the colour keys.

Cursor-movement is controlled by four keys. Old timers, used to the 64 or Vic 20 could be caught out by the cursor keys' move to the top row. Commodore never fails to rearrange a number of keys on a new machine — a well-established tradition.

The machine's full typewriter-style keyboard is attractive. For those who use disk drives with this machine, the well-known Basic 4 disk commands, missed on the 64, have been incorporated here in the Basic 3.5. Wear and tear on the hardware caused by switching the machine on and off has been eliminated. The Reset button, well-recessed to avoid accidental pressing, not only resets the machine completely but, if pressed while holding down the Run/stop key, enables you to jump to the machine code monitor. This acts like a Butterfield switch, as it is known in the Commodore fraternity.

Commodore 64 users have been frustrated by the machine's liability to crash, leaving them powerless to escape and investigate it. The machine becomes confused, leaves the normal mode of operation, and any amount of key pressing is to no avail. All you can do is to reset the machine and start from your last saved version of the program. This is particularly a problem where machine code programs are concerned. Any mistake made in a Basic program is normally trapped by Basic, but machine code errors normally leave you with a condition which you cannot remedy.

However, on the C16, you can operate easily and confidently. If your program crashes you reset the machine, jump out of the monitor by hitting X, and find to your pleasure that the Basic program is usually still there. Additional information is given in the user manual on how to un-new a program when you have accidentally eliminated it.

Software

At the time of writing, software for this machine is conspicuously absent. However, the C16 is produced by one of the top selling micro companies both in the UK and in the world. The amount of software becoming available for a machine depends on the software producers' view of its potential success. The Vic and the 64 have sold worldwide, so software houses should be falling over themselves to produce games and application software for the C16.

The Plus 4, announced at the same time as the 16, is very similar, which means the minimum of effort is necessary for software houses to convert programs to run on those machines. Virtually any software package you could want is likely to be available for this machine within about a year.

Basic

Apart from the absence of sprites and a reduction in the sound facilities, this Basic represents by far the best that Commodore has produced so far.

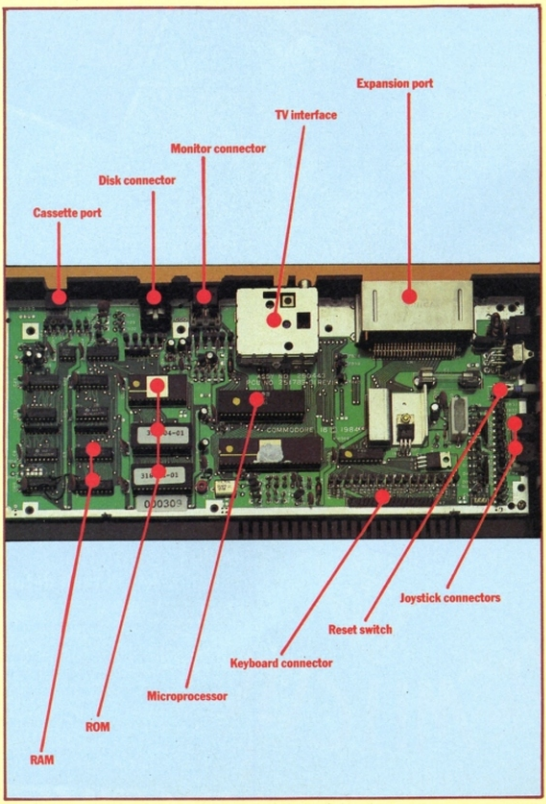
First, it is a proper disk Basic with commands like DIRECTORY, COPY, BACKUP, VALIDATE and DE-LOAD. The ability to load a directory without disturbing the

Table 2:

Additional functions implemented by Escape

Escape followed by one alphabetic key yields:

A Automatic Insert Mode.
B Set bottom right corner of window.
C Cancel Insert Mode.
D Delete current line.
I Insert a line.
J Move to start of current line.
K Move to end of current line.
L Turn on scrolling.
M Turn off scrolling.
N Return to normal screen display size.
O Cancel Insert, Quote, Reverse, and Flash Modes.
P Erase up to beginning of current line.
Q Erase up to end of current line.
R Reduce screen display.
T Set top left corner of screen display.
V Scroll screen up.
W Scroll screen down.
X Cancel Escape function.



Even though the C16 looks similar to the Vic 20 and the CBM 64, a number of the keys have been altered. The two keys used for controlling the cursor have been replaced by four keys and moved to the top row. Function key F8 has been replaced by a Help key that will highlight any errors.

program which is in memory is particulary important, especially to new users.

The so-called Toolkit commands are at last well-represented in the Basic within a Commodore machine. Automatic line numbering, deletion of sections of programs, turning Trace on and off, renumbering Basic lines; all are now available in a standard machine. Getting into the machine code monitor is now accomplished elegantly by typing the word MONITOR, rather than having to use a SYS command. PRINT USING is now available and it is an advanced form, enabling you to do most of the formatting definitions you want quite easily.

Error trapping is available with a special TRAP command enabling you to trap what the error is and give a suitable error message to the user.

The GETKEY command enables the machine to take a series of single characters from the keyboard without having to write line numbers which use GOTO and jump directly there.

Until now Commodore machines have been justifiably criticised for the difficulty in achieving structured programming. However, in this implementation IF . . . THEN . . . ELSE, DO . . . WHILE and DO . . . UNTIL, are present. Structured programming enthusiasts should note Comal on the Commodore 64 is due to become available soon, and it seems extremely likely this will be made available for the 16 too. If Comal is put into cartridge for this machine, sprites may even be created for it. After all, the Comal team created sprites on the Pet, using their own high-resolution graphics board.

Colour commands and high-resolution graphic commands have been taken out of the realm of frantic poking and put into the Basic where they belong. They include painting, drawing circles, drawing rectangles, drawing lines and so on. You even have a SCALE statement. Graphs where all the tedious tasks of scaling the information is taken on by the C16 are possible.

Sound is also well represented though there is one less voice than on the 64.

There is evidence that the speed of the C16's Basic doesn't match the 64's, but this should prove acceptable in view of the increase in capability.

Even the machine code monitor (absent from the 64) is better than the monitor associated with previous Commodore machines. The memory-dump includes an ASCII dump and the disassembler, and the memory dump produces screenfuls of information, one at a time. Although it's a pity bi-directional scrolling isn't available, both in Basic and in the monitor, the monitor still represents a major step forward.

Verdict

The new machine provides an excellent introduction to computing with a good Basic, user-friendly editing, high-resolution graphics and sound. There is the full expectation of massive support by independent software producers.

Packaged as it will be, the C16 represents a good deal. The intrinsic value of a 16K RAM computer is not an issue. The Vic 20 has remained popular despite the success of the 64. The reason is skillful bundling of software and cassette with the machine, together with the vast array of increasingly available software. Where cartridge software is involved, the limitation of memory is partly overcome anyway.

It could even be Commodore's way into Britain's classrooms.

The Commodore 16 is definitely the machine to watch out for in the run up to Christmas: it may beat the pants off the other sub-£200 machines. PCN

SPECIFICATIONS

Price	£139.95, including cassette drive, *Introduction to Basic Part 1*, and cassette, and four recreational programs.
Processor	7501 running at 0.89 to 1.76 MHz.
ROM	32K
RAM	16K-12K accessible to Basic.
Text	40×25.
Graphics	320×200.
Keyboard	integral full travel with four function keys.
Interfaces	user port, ROM cartridge and parallel disk drive port, two joysticks ports, Commodore 1531 cassette interface port, monitor output, composite, chrominance, luminance, audio input/output.
Storage	Commodore 1524 disk drive, Commodore SFS 481 fast disk drive, Commodore 1531 datasette.
Language	Basic
Distributors	Retailers

Pen Pal

This nifty plotter won Kenn Garroch's approval.

A plotter, like a robot, is one of those peripherals most computer users would like to have but feel they cannot justify the expense. The Parfitt plotter may be the answer as it is fairly cheap. Far from being just a flat bed plotter, it can be used for scanning pictures, milling shapes out of polystyrene, engraving glass and, due to its flexible design, anything else you can think of.

Presentation

The standard plotter comes with three pens, some paper, a manual and software on cassette. It measures about 58cm by 44cm and has a tasteful smoked plastic dust cover. The paper size is normally A4 though at a pinch it can be used with A3. However, not all the pens can then be used, due to their not accessing exactly the same area.

Each pen is slotted into a tube-like holder and lifted up and down by means of a solenoid. The pen holders are flexible enough to allow almost any type of pen, from the rather expensive fine pointed plotter pens to low price Parker felt tip refills.

At the moment the plotter is available only for the RML Zs, the BBC B and (in future) for the Commodore 64. It is not hard to recognise that the system is aimed at the educational market.

The demonstration software came on disk and was fully menu-driven. Although these programs could have been better, they do their job well. Some of the demo options are: point to point plotting and pen selection, drawing of multiple polygons, an opto sensor scan routine, and some examples of what can be done with the opto system with a picture copied from a map of Britain and a gearbox cross-section.

Also supplied with the review model was *Glasstem*. This allows three-dimensional wine, beer, or spirit glasses to be designed on the computer's display and plotted out onto paper.

Getting started

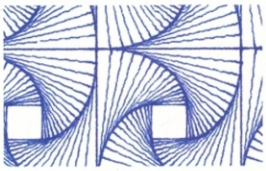
The plotter was set up with a BBC B and connected via an interface to the user port. There is the option of using the BBC's own built-in power supply or, for those who happen to be running disk drives, there are two separate supplies available at an extra cost of £89.70 and £48.30. The more expensive version provides extra power for the milling attachment and has a rotary potentiometer for speed adjustment.

The most difficult part of setting the plotter up was adjusting the pen height. However, this is explained in great detail in the instructions.

Once the pens are in position, simply dropping them into their assigned tubes means the plotter is ready to start drawing. The Demo disk was autobooted and one of the options selected.

This is where the problems started. There was no precise explanation of where the origin was or how to get there. This meant that in some of the early drawings the carriage juddered against its stops and the software got lost, thinking that it had reached its desired position when it had jammed. The only solution seemed to be to press the BBC's escape key, thus rebooting the disk.

The review system seemed to get lost in other places as well. However, when I removed the Torch OS from the sideways RAM and rebooted the whole system it worked more or less faultlessly.



In use

After getting a little tired of the demo drawings, the next thing to do was to have a look at the direct control routines. These are all available to Basic via a set of CALLS:

MOVE,X,Y Move to absolute position, pens up.

DRAW,X,Y,pen Draw to absolute coordinates with the specified pen.

LINE,X1,Y1,X2,Y2,pen Draw line from X1,Y1 to X2,Y2 with specified pen, lifting it at the end.

SPEED,S Set the plotting speed.

STRING,A$,size,pen Write A$ at current location and orientation.

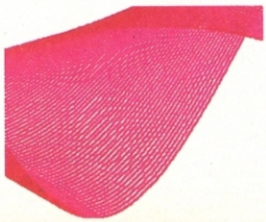
ORIENTATION,O Select character orientation on each 90 degrees from each other.

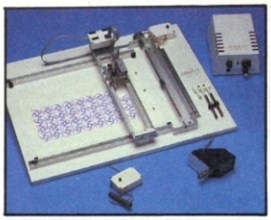
BOX,X1,Y1,X2,Y2,pen Draw a box X1,Y1 being the bottom left coordinates, X2,Y2 being top right.

INITIALISE Return to origin and reset pens and character sizes.

OFFSET,X,Y Move the origin to X,Y

Most of these commands are similar to those used in BBC Basic, so translating pictures drawn on the screen to the plotter is quite straightforward.

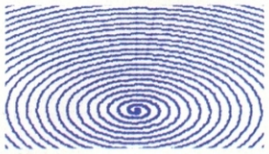




The major drawback with this plotter was its lack of speed, but adjustments were possible via the SPEED command. If the drawings were to be at all accurate, the best thing to use was the slowest possible speed which, for some drawings, meant leaving the system to get on with the job and coming back three to four hours later.

The opto sensor system is set up by replacing one of the pens with the sensor and using the supplied software. The computer then scans the picture line by line and transfers the monochrome result onto the screen. The best results were obtained with pictures that had a sharp black and white contrast although, with a little software aid, the results can be improved dramatically.

The milling attachment is meant to be used with polystyrene sheets but produces pretty good results with baked clay. It has the advantage of being an educational tool as well as good fun. A full scale computerised milling machine can cost anything upwards of £10,000, but a simple plotter costs about £517.50 with a router attachment. The latter can therefore be used to demonstrate all the principles and their results at a 20th of the cost.



Another attachment is a scriber which can be used to engrave glass or scraper board. The best effects were obtained with mirror tiles. These were first coated with nail varnish and, after scribing, placed in etching fluid.

Verdict

The best feature of this plotter is its versatility. It is possible to attach virtually anything to it that needs to be transported over a set X, Y area. At £310.50 for the basic model and £563.50 for the full kit including driller/router, opto sensor power supply and scriber, it is quite cheap compared with the competition. Though it could be more accurate, it is still more than adequate. PCN

Product Parfitt DP 025 Plotter **Price** £310.50
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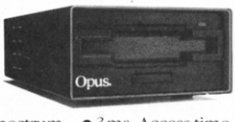

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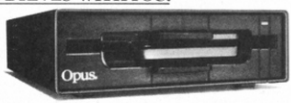

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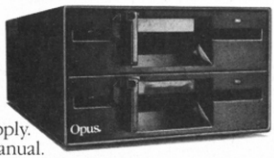

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Games

Roomlord from Paramount is a multi-screen arcade/adventure which is far from easy. You control a figure which bears more than a passing resemblance to one of the heroes of Atic Atac and have to collect heirlooms such as tiaras and guitars from the 16 rooms. Having entered a room you are faced with numerous hazards and can only leave by being killed or collecting the treasure. You can destroy the guardians — dragons or cowboys — by throwing your Magic Star.

Havoc comes from a new software house, Dynavision, and is rather like *Zaxxon*. You fly a fighter across a scrolling city-type landscape, dodging through narrow apertures and evading oncoming fighters and falling bombs. The graphics are well done, but the joystick response is sluggish.

Trollie Wallie is Interceptor Micro's follow-on to *Wheelin' Wally* and *Wallie goes to Rhymeland*. In it you guide Wallie on a shopping spree through a department store, avoiding obstacles on the way. Wallie has to collect forty items, but he can only carry five at a time and once this limit is reached he has to go to the checkout to pay for them.

Software Projects, now importing games from the USA, is also licensed to convert games for a variety of machines. One of its first imports is *BC's Quest for Tires* — a very strong contender for *PCN*'s oddest title of the month award. The game is from Sierra-On-Line which produces top-quality games for the 64, Apple and Atari. Software Projects also has arrangements with such famous names as Broderbrund and CVS Technology. The arcade game *Hunchback at the Olympics* from CVS will soon be available on the Spectrum and the 64.

Poltergeist for the Spectrum will soon be available and takes place in a 15-room house. You must visit each room, avoiding household objects which begin to move around as you progress. Your aerosol can of holy water will deter the poltergeists, but is easily exhausted. Should you come face-to-face with the phantom itself, you will need at least a quarter of a can of the deadly stuff to exorcise it.

Forest at World's End is a graphics adventure in which your task, as the mightiest of ancient warriors, is to rescue the princess Mara from the clutches of the evil wizard Zan. The phrase analyser looks impressive. It allows you to use adjectives and compound commands.

Avalon is Hewson's latest and will be released on September 16th. Billed as: 'the adventure movie' the company claims that it represents a major breakthrough in programming technique as the first adventure game with three-dimensional graphics. Like *Valhalla*, it will allow real-time player interaction with the characters and we will be bringing you a full review as soon as we get our hands on it.

On the prize front, there is *Quo Vadis* and *Starbike* from The Edge. *Quo Vadis* (Latin for 'Where are you going?) offers you the chance to win a Golden Sceptre. A graphics adventure, the game requires you to find your way through caverns, killing some of the 38 animated monsters, and solving riddles which will help in the search for the Magic Sceptre. Starbike's prizes include a free subscription to Computer and Video Games, free cassettes or a BMX bike. Unusually, you do not even have to play the game to win — each cassette comes with a number which offers you the chance of winning. The Edge call *Starbike* a 'space arcade adventure' and your brief is to collect lost aliens from various planets, avoiding or destroying interstellar flotsam and jetsam.

Utilities

Spectrum Sound Effects comes with 50 noises such as Car Engine, Lazer Zaps and Penny Whistle. The package allows you to develop complex sounds on the Spectrum, and save them to tape for later use in your programs.

The Memotech *Utilities* package is very cheap and contains programming tools like a Renumber routine, binary/hex/decimal conversion, 40 column text and data save/load.

The QL monitor will prove an invaluable aid to 68008 programmers. It allows you to examine the contents of addresses, insert memory, search for strings or hex numbers, compare, move and so forth. KAT is also producing a character generator for font designing.

Triptych's releases for the Spectrum, 64 and BBC include *Entrepreneur* which will help you to learn about planning business ventures and includes information about working capital, break-even points and profit and loss. On a lighter note, *Star Watcher* lets you plot the 1500 brightest stars and will help you learn to identify the constellations. PCN

BBC

Fantasia Diamond	£7.95	Hewson Consultants 0235 832939
Mini Office	£5.95	Database Publications 061 4568383
Project Planner	£19.95	Triptych 0753 889988
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COMMODORE 64

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Versatile McVid

This machine code graphics utility achieves a great deal with only 1.5K, says Simon Williams.

This time last year presented few offerings for the programmer who wanted to experiment with machine code sprite routines on the BBC micro. Since then with many new programs issued, routines of this type have become comparitively commonplace. Some have been listed in the magazines. So a new program, especially at the fairly hefty price of £14.95, has to offer different angles to justify itself.

Features

The main difference between McVid and other graphic utilities is that it is intended for the machine code programmer and not the writer of Basic games, although Basic can be used to control the routines. As such, it has to fit into the category of program that is sufficiently useful to the machine code author that he/she would rather make use of it than write routines from scratch, tailor-made to a particular application.

McVid offers routines to handle line drawing, sprites and screen scrolls to left and right. Separate sets of code are supplied for each of the BBC's graphic modes, not just Mode 2 as is often the case. Collision detection is provided in the line drawing routines, and drawings may also be scaled up and down, and rotated. The code for all these functions occupies only 1.5K plus the shape data.

Presentation

McVid is very professionally finished and comes complete with a glossy covered, ring-bound manual by author Jim Gray. As well as the individual routines for each graphic mode, both tape and disk versions include a demonstration program which has a lunar module rolling in to land on the surface of a moon, before splitting in two and disappearing back to a full colour home planet, which has been slowly passing across the screen.

The lander is a multi-coloured line image which grows and shrinks realistically on its two journeys, and the whole demonstration finishes by scrolling the scene rapidly left and right before repeating. A rather unfortunate after-image of part of the lander remains after it has blasted off, but the whole demonstration certainly shows McVid in good light. The majority of the demo is written in Basic and is listable.

Documentation

Pica seems very fond of offering listings, since half its manual consists of a printout of the routines involved in Mode 5. Although this is well annotated, it is really not sufficient instruction in the use of the program. Description of the line drawing routines runs to only three A5 pages and that for the sprite routines to only four. Quite a lot of information is contained within this space, but it is awkward to extract, and only for the experienced.

Documentation often used to be considered a necessary annoyance by software houses, but most have now come to appreciate what a real affect it can have on sales. I feel Pica could have done a lot more to explain its product.

In use

To use either the line drawing or sprite routines, a corresponding table of shape start addresses must be set up in memory. Page &900 is used for this and puts an overall restriction of 256 bytes on the address table. This translates to a maximum of 32 sprites or line drawings in use at any time. Page &900 is normally used for sound envelopes 5 or 16 or the speech processor buffer, so using either will overwrite the shape table.

The routines use other areas of low memory, in particular &90 to &96, part of the area in page zero reserved for the Econet system. Choosing these areas is sensible, as they are unlikely to be used on machines whose main purpose is developing games software.

Each line is described by three bytes of data, its colour and the X and Y coordinates of its finishing point. The line drawing routines assume that each line starts from the end of the previous one. This is an economical way of doing things, although it does, of course, limit the length of any individual line to 255 units. Two re-usable graph sheets are included in the manual to assist with shape and sprite design. The shape data bytes themselves may be stored at any convenient point in memory.

Sprites are defined in a similar way to line drawings, using the second half of page &900 to hold their address table. Each byte of the shape data holds information about the colour and position of the sprite bytes and they are, of course, configured differently depending on the graphic mode in use. These bytes require some pretty complicated setting up and I believe the package should include a sprite and line drawing definer to take the hard slog out of the procedure. Just because the package is intended for the machine code programmer doesn't mean he or she should be expected to work it all out by hand.

None of the extra facilities provided by other sprite packages—such as animation, choice of size, preset routes — are provided directly by McVid, although the structure of the package allows these features to be written by the programmer. It does require some detailed knowledge of machine code programming to do this efficiently, however.

The fast scrolling routines give true scrolls — without every column on the screen moving up a line each time it reaches either edge.

Verdict

There's no doubt that McVid provides versatile routines for handling line drawing and sprites from within machine code or Basic. To do what it does in 1.5K is quite a programming achievement, but I feel Pica is severely limiting its potential audience by not including a character/line definer and by not properly describing the routines in the accompanying manual.

PCN

RATING (/5)

Features	4
Documentation	2
Performance	4
Usability	3
Reliability	4
Overall value	4

Name Mc Vid **System** BBC Micro A & B, Electron **Price** £14.95/£15.95/£18.95 **Publisher** Pica Software, 4 Beech Court, Pocklington, York Y04 2NE **Format** Cassette/disk **Language** Machine code **Outlets** Mail order/retail.

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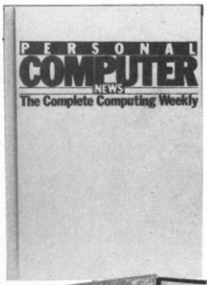

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PCN PRE-TEST SOFTWARE

Comal 80 is ace for structured programming on the 64, says Barry Miles.

Comprehensible Comal

Comal 80 is a cartridge which will be released in the near future by Commodore for the 64. Comal stands for Common Algorithmic Language and is designed to be better than Basic or Pascal by combining the best features of both of them, and being extremely user friendly into the bargain.

In use

When the language is in the machine, you still have 40K of memory available for your Comal program. In addition, some 12K is available for use by machine code programs.

Comal is the Basic to end all Basics. It makes teaching yourself programming an easy and enjoyable experience. It scores highly compared to other languages because of its very strict adherence to the principles of structured programming and its amazingly helpful error correction and detection features.

No stone has been left unturned to make this language extremely easy to learn. Not only do you write your programs quickly, but they will be running correctly far sooner than with an unstructured Basic. This is made possible by a pre-pass system in which the syntax of every statement you have entered is checked and errors are pointed out in detail.

A truly structured language such as Comal imposes constraints and reduces the liberty with which you can plan and design your programs. However, it also stops you from concocting such convoluted code that no-one but yourself can understand it.

Comal, being pre-compiled, is an extremely fast language in operation. Searching 1,000 strings to see whether any one of them contains a particular sub-string is 1,000 times faster with Comal than it is using the Commodore 64's normal Basic with the MID$ command.

The cartridge contains no less than 11 separate modules which can be invoked with the command USE, so you might say USE GRAPHICS in order to invoke the graphics pack.

When the 64 was designed, no effort was made to enhance Basic to include appropriate graphics keywords. With Comal's interrupt-driven sprites you can set sprites in motion, carry out some other activities in your program while the sprites continue to move, and then interrupt their movement at will. This means that writing games in Comal will be a good substitute for writing games in assembly language and the results will be almost as fast. Similar interrupt-driven treatment is also given to the sound commands. Sound routines can be written so music plays while the rest of your program is running.

Programming in Comal is pure delight. The AUTO command produces automatic line-numbering, but line numbers are always four digits long, so 10 becomes 0010. As you write your program, the interpreter or compiler works in such a way that indentation of appropriate structures is automatic. The indentation provided by Comal is more powerful than it seems because, by looking down a listing, it's very easy to see whether or not you've closed off the structures you've started. Also, the language will tell you that you have failed to complete a particular construction and will display the offending line.

Reference to the manual is infrequent because the language itself will tell you where you are going wrong. Editing commands include RE-NUMBER, FIND, SEARCH, REPLACE, and DELETE, and you can delete or list procedures by name.

Structures

A 'procedure' is a piece of code which carries out a particular function. It has one entry point and one exit point only. In Comal, procedures can either be open or closed. In the case of a closed procedure the variables in it are local to that procedure. The significance of this is that you can import procedures from your library of routines, or from someone else's, knowing that there will be no clash of variable names. The process of building up your program then becomes one of joining together a series of procedures from various sources to form one major procedure which carries out the task.

This greatly facilitates structured programming using the top-down method. The top-down method defines the problem to be solved as a series of tasks. Each task may be divided into a group of sub-tasks and so on. You continue this process of 'stepwise refinement' until the list is so detailed you can simply write the code to do each part.

Translated into the Comal environment this implies writing your main program as a list of procedure names. You then write the procedures and test each one. Once the testing is satisfactory, you can put all the procedures together to make the program.

It is said that the single most effective enemy of good programming is the GOTO command. Tracing the flow of events through a program involving many GOTO's is frustrating. Comal avoids this by calling up blocks of code by the name of the procedure and by parameter passing.

IF . . . THEN, ELSIF and ELSE are provided, as are full looping structures. DO WHILE, DO UNTIL and a CASE structure have been borrowed from Pascal. Armed with these programming tools it's extremely simple to program in a straightforward manner so that anyone reading the program can see exactly what's involved.

Verdict

Comal revolutionises the Commodore 64. It makes learning structured programming easy and the speed with which the graphics, sound and other parts of the language operate implies that machine language will rarely be required. And if the price is right this package deserves to be highly successful. PCN

Name Comal **Application** programming language **Price** TBA **Supplier** CBM, 0753-79292 **Other versions** None **Format** Cartridge **Outlets** Commodore dealers.

COMMODORE 64

Stellar System

Name Stellar 7 **System** Apple II series and Commodore 64 **Publisher** Penguin Software **Format** Disk **Price** $29.95 **Outlets** Retail.

It takes a good game to capture the imagination of *PCN*'s team of jaded games players. Stellar 7 managed easily.

Objectives

Those awfully nasty aliens are invading Earth again and you're our last hope. The only chance of success lies in your vehicle, the Raven.

You begin in our solar system and have to fight off sufficient enemy units to find the Warplink, a sort of Einsteinian awayday ticket that whips you off to distant corners of the galaxy. You must do battle in six systems before arriving at the alien stronghold.

In play

Those of you who remember Battle Zone from the arcades will be on familiar ground here, although Stellar 7 is a better game in many respects. What sets it apart from the run-of-the-mill action games is the attention to detail. You can select joystick or keyboard control, read a mission profile or go straight into the action.

A display of the opposition units is contained in a separate file and there are some nice touches of humour here. You can review all of this material between games, or skip it if you wish, although it contains some useful clues.

You begin on Earth beneath a blue sky inhabited by flying machines. A range of mountains sits on the horizon with the ground littered by large blocks and land vehicles. The blocks act as obstacles to movement but also offer some protection against enemy fire.

The rule at this stage is simple: if it moves, blast it. On the right of the screen two indicators show your energy supply and shield strength. Every hit you sustain reduces your shields by about a tenth.

When things get hairy you can invoke your Inviso Cloak. The screen display becomes an eerie black and red and you can prowl around in comparative safety, but it consumes energy at an alarming rate.

If you can zap about 150 points-worth of alien equipment a Warplink will appear and this will transport you to Antares where even more aliens await. Next stop is Rigel and your first intermediate objective — a refuelling pod.

As you progress, the opposition gets tougher. The graphics are splendidly concieved and executed in wireframe style, and the animation is quick and smooth.

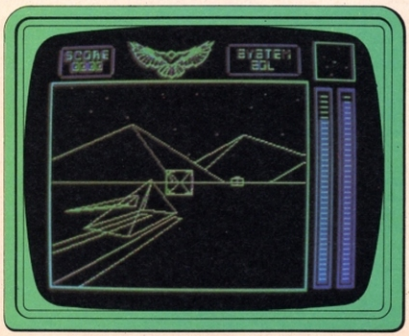
Verdict

Definitely a game for the connoisseur — a fast trigger finger isn't enough, you must think as well.

Peter Worlock

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	



ATARI

Ewing Feud

Name Dallas Quest **System** Atari 32K **Price** £12.95 **Publisher** US Gold, Centresoft, West Midlands 021 520 7591 **Format** Disk **Language** Machine code **Other versions** Commodore 64 **Outlets** Retail

Y'all gonna have a mighty big prarblem when you arrive at Southfork. Sue-Ellen has a proposition for you which JR ain't gonna like.

Objectives

Jock Ewing left a map of a new and rich oilfield with his old chum and former wildcatter, Chugalug Jones, who now runs a trading post in South America. Sue-Ellen wants you to get the map for her so that she can become financially independent of JR. But she's got to beat JR to it.

In play

Dallas Quest is a traditional text adventure complemented by high quality graphics and occasional sound effects.

Each location is impressively depicted in high resolution, filling the top half of the screen. What's more, certain objects in the picture disappear and reappear as you take or drop them. The text area occupies the lower half of the screen, the picture staying put until you move to another location. You can enter text-only mode by typing PICTURE, — the same command brings the graphics back when you want them.

To make life easier, the game offers numerous clues, but will allow you to access only up to nine of them in one game. The number of clues available is displayed at the top beside an indicator of possible exits from the current location.

The familiar theme tune trumpets out and you find yourself in the living room at Southfork, with Sue-Ellen sitting demurely on the sofa. Your first major problem is getting out of Southfork — JR just might have hired some burly ranch-hands to watch out for you. If caught, you'll see a giant fist crashing towards you before everything starts to go black.

Once in the South American jungle, you'll meet a delightful monkey with a habit, and I don't mean clothes. Watch out for a cannibal chief since there's more to him than meets the eye.

Not all the objects you find will be of use, but it's up to you to discover which are the red herrings. It's a good-humoured adventure — try blowing the bugle, firing a rifle, or feeding the horse.

Violence is almost non-existent so, with the availability of a large number of very helpful hints, Dallas Quest is an ideal adventure for the family.

Verdict

Undoubtedly the best designed graphics I've seen in an adventure. It's a jolly yarn and one which will give a lot of pleasure whether you're a Dallas fan or not.

Bob Chappell

RATING (/5)

Lasting appeal	
Playability	
Use of machine	
Overall value	

'Will you still love me when I'm 464?' Simon Williams looks at old favourites on the Amstrad.

Amstrad editions

An old computing proverb states that any machine is only as good as the software it will run. In the case of the AmstradCPC 464, the first programs to become available from the company's own software house, Amsoft, are almost exclusively games. They are all priced at £8.95, a good deal more than equivalent programs for other machines. How, then, do they compare?

The first thing to note about this batch of software is that it is composed largely of conversions of successful programs for other machines. There is nothing necessarily wrong with this, as it is a good way to attract potential buyers. It may, however, mean that the full features of the new machine are not fully used, especially if the conversions have to be hurriedly programmed.

Amsoft has taken the unusual step of setting itself up as an umbrella organisation to handle the marketing of programs produced for the 464 by several well-known software houses.

HARRIER ATTACK

With successful versions of this program for the Spectrum and Oric already available, the 464 version from Durell Software offers all the features of the original, plus better sound than the Spectrum version and four realistic colours.

It's awkward having to use the space bar to drop bombs even when controlling your plane with a joystick. If using the keyboard, an immediate advantage is gained over a Spectrum game in the response of the excellent keyboard on the 464.

I was annoyed that the range of my missiles seemed shorter than that of the enemy planes, and that I only got one plane. But at several million pounds each, I suppose that was only fair.

MASTER CHESS

Every good micro should have a good chess program and Micro-Gen's version will give you a challenging game (rather too challenging for my standard of play).

It offers ten levels of play, which determine the ply of search the program uses. An opening book of some 6,000 moves is written in and on-screen tally is kept of the past 13 complete moves. The colours of both sets of pieces and the board may be changed at any time and chess puzzles may be set up.

If requested, the program will offer a best move at any point. But whenever I used it, it seemed to suggest moves decidedly more favourable to its own strategy.

The only other point against Master Chess seemed to be its inability to recognise mate. I had to abandon several games when I had no valid moves and was in check, but was not mated.

ELECTRO FREDDY

Soft Spot has produced several well-written programs for the BBC micro and three, including *Electro Freddy*, have been converted for the Amstrad. Freddy, according to the cassette insert, is a kind of urban guerilla bent on preventing Uncle Claude Sincrum from upping the price of his products and causing redundancies at his factory.

The chosen method is to push everything on screen onto the despatch conveyor before Claude can get his hands on you. You do this in a vaguely Pengo fashion, while avoiding Claude, the spectrims he throws at you and the oracs that are periodically dropped from the roof.

Each screen uses a different product, from computers to alarm clocks to trannies, and the game gets harder with an increasingly complex warehouse layout and the introduction of a force-field between Freddy and the conveyor. The chunky graphics move well and, while not the most complex game in the world, Electro Freddy is a lot of fun to play.

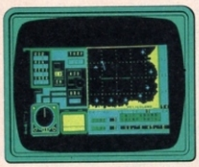
CODENAME MAT

This Micromega Spectrum hit converts well to the Amstrad machine. Complicated, it combines the best qualities of both strategy and arcade games.

It's something like the Atari classic *Star Raiders* to play, itself similar to *Star Trek* with real-time arcade elements added to make it more exciting. Where *Codename Mat* scores over either is in the quality of the graphics (attacking ships, bolts, asteroids and star gates) and the facility to direct allied fleets against the enemy as well as zooming around the solar system shooting up anything that comes within range.

I can't claim to have mastered this game; it takes a lot of practice and I find the speed controls particularly difficult to use effectively. It is only too easy to enter an area under attack and streak straight past the enemy without firing a shot.

HUNTER KILLER



This game of submarine warfare was originally written for the Spectrum and published in a monthly computer journal. It proved so popular that the cassette of the game achieved success in its own right, and now Protek has converted it to run on the CPC 464.

The game plan takes place off the coast of Germany and Denmark during the second world war. The player is in command of an S-type submarine with orders to disrupt enemy submarine traffic in the area.

The screen depicts the control room of the submarine, complete with radar, Asdic, charts, periscope and numerous digital readouts. Control of the sub is complex and you will have to put in a fair amount of study, just as for a flight simulator, to be able to control the craft properly.

It's worth the effort, though, since Hunter Killer can generate a feeling of high tension during a close run game.

All the games are available from retailers or from Amsoft, 169 Kings Road, Brentwood, Essex. Tel 0277 230222. Prices £7.50 to £8.50.

SNAKE SNAKE SNAKE

Title: *Snake*
Machine: *Atari 800*
Language: *6502 machine code*
Application: *Game*
Author: *F M O'Dwyer*

An old favourite arcade game has been zapped up for the Atari. Written in machine code, Snake, by F M O'Dwyer, will need all your skills to keep ahead.

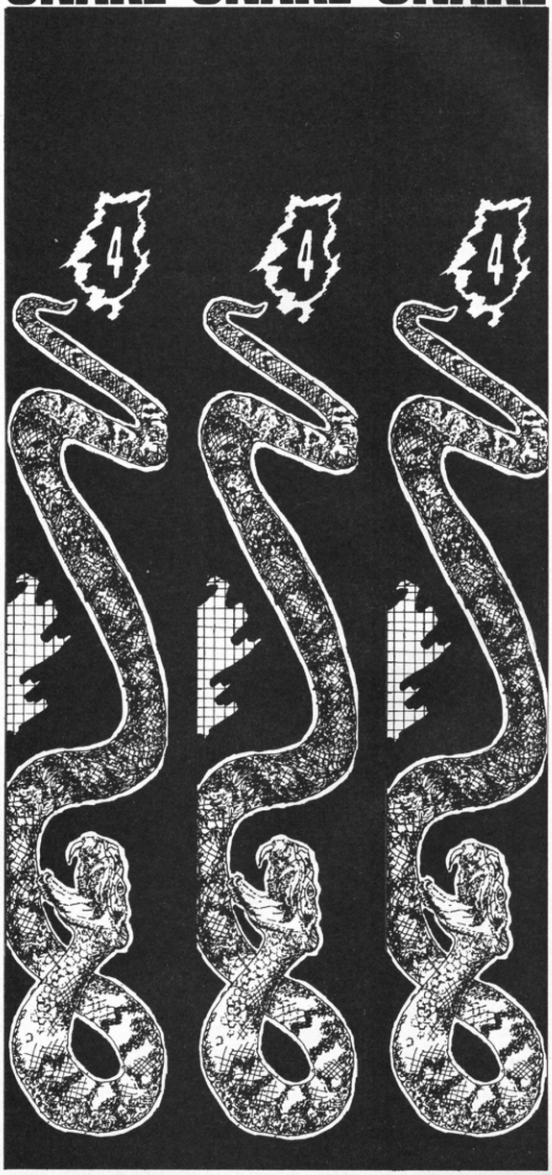
Control is via a joystick in port 1 of the Atari and using this you can guide the snake around the screen aiming for the numbers which appear from time to time at random positions. If you are unsuccessful the number changes into a deadly obstacle.

It is therefore wise to try and get all the numbers, even if they are a low value, or you will be constantly obstructed. For some reason it seems far easier to bump into the obstacles than the numbers.

If you do manage to get to a number before it changes, your length will increase by an equivalent number of segments. Points are scored each time you get a number. You must also be careful not to bump into your own tail and this gets increasingly difficult as you grow.

If you go off the edge of the screen you wrap around, which is quite confusing with the game so fast. Just when you think you know where you are, you are suddenly wisked over to the other side of the screen. Obviously a great deal of practice is required.

You gain a life every 1000 points. Pressing START starts a new game and pressing OPTION allows you to change the speed of the game. A check sum is included in the program to ensure you type the data statements in correctly.



Program notes

100	Sets up the screen for the introduction page.
110-190	Prints instructions.
200	Closes and opens the keyboard and gets input. The close is executed first to make sure there is no open error.
210	Prints 'please wait' as data is being loaded.
220	Reads in the number of data statements for use in line 330.
230	Reads in start and end address data.
240	Converts the four eight-bit numbers to 16-bit addresses.
260	Reads in data.
270	Checks the number of data statements to make sure they are all there.
280	Checks sum to ensure data has been input correctly.
290	Turns off any current sound, selects the graphics screen mode, and executes the machine code.
300	Checks the flag and reset A if not set.
310	Set the flag.
320	End of subroutine.
330-1890	Data for the machine code.

```
100 GRAPHICS 0:SETCOLOR 4,2,6:SETCOLOR
 2,11,10:SETCOLOR 1,0,0:POKE 752,1
110 ? "                SNAKE"
120 ? :? "  Using a joystick in port
 #1, guide";? "the snake over the numbe
rs which"
130 ? "appear from time to time.  If y
ou are";? "not successful in doing thi
s within"
140 ? "the time limit, then the number
 turns";? "into a deadly obstacle.  Ho
wever, if"
150 ? "you do succeed, the snake will
 grow";? :? "  If you run into an obs
tacle or"

160 ? "your own tail then you lose a l
ife.";? "You gain a life every 1000 po
ints.";:?
170 ? "pressing START starts a new gam
e.";? "pressing OPTION allows you to c
hange"
180 ? "the speed of the game.  Press o
ption to";? "enter change speed mode.  E
nce to";? "subsequent press takes you to t
he";? "next speed.  1 is fastest, and
 9 is";? "the slowest."
190 ? :? "  press any key to begin
200 ? :? "
210 POSITION 2,22:? "                 please w
ait."
220 READ M,I,I:TRAP 280:CHK=0
230 READ SLO,SHI,LLO,LHI
240 ST=SLO+256*SHI:LT=LLO+256*LHI
250 GOSUB 300
260 FOR I=ST TO LT:READ X:CHK=CHK+X:PO
KE I,X:NEXT I
270 IF (LT-ST)<>N THEN 230

280 IF CHK<>164459 AND CHK<>164812 THE
N GRAPHICS 0:? "SOME ERROR - CHECK DAT
A STATEMENTS":END
290 SOUND 0,0,0,0:GRAPHICS 0:X=USR(A):
END
300 IF FLAG<>1 THEN A=ST
310 FLAG=1
320 RETURN
330 DATA 1559
340 DATA 255,255,0,48,16,54,169,0,141,
150
350 DATA 48,141,151,48,216,169,64,133,
16,133
360 DATA 64,169,8,133,2,169,48,133,3,1
370 DATA 2,133,9,32,154,48,32,184,51,3
2
380 DATA 191,48,32,237,52,32,31,53,173
,231
390 DATA 208,201,3,240,240,169,0,162,2
0,160
400 DATA 14,32,138,53,173,31,208,201,6
,208
410 DATA 233,173,31,208,201,6,240,249,

169,0
420 DATA 141,148,48,141,149,48,169,3,1
41,152
430 DATA 48,169,16,141,153,48,32,191,4
8,32
440 DATA 235,48,169,0,133,20,133,19,13
3,18
450 DATA 32,26,49,165,19,201,1,208,10,
169
460 DATA 0,133,19,32,232,53,32,103,51,
173
470 DATA 31,208,201,6,240,191,201,3,24
0,155
480 DATA 174,0,6,160,0,136,208,253,202
,208
490 DATA 250,76,104,48,0,0,0,0,0,0
500 DATA 173,48,2,133,212,173,49,2,133
,213
510 DATA 160,7,169,4,145,212,200,192,2
9,208
520 DATA 249,160,3,169,70,145,212,160,

6,169
530 DATA 6,145,212,32,191,48,96,165,88
,133

540 DATA 212,165,89,133,213,162,0,160,
0,138
550 DATA 72,152,72,169,0,168,145,212,2
30,212
560 DATA 208,2,230,213,104,168,104,170
,232,208
570 DATA 1,200,192,3,208,229,224,152,2
08,225
580 DATA 96,32,170,53,162,20,142,0,6,1
42
590 DATA 21,49,232,142,2,8,160,11,140,
22,2
600 DATA 49,140,1,8,140,3,8,169,4,141
610 DATA 24,49,169,0,141,25,2,169,11,
141
620 DATA 23,49,96,0,0,0,0,0,173,120,
630 DATA 2,201,15,240,51,162,0,134,77,
174
640 DATA 23,49,201,11,208,7,224,7,240,
36
650 DATA 141,23,49,201,7,208,7,224,11,
240
660 DATA 25,141,23,49,201,14,208,7,224
,13

670 DATA 240,14,141,23,49,201,13,208,7
,224
680 DATA 14,240,3,141,23,49,173,23,49,
201
690 DATA 7,208,17,238,21,49,173,21,49,
201
700 DATA 40,208,68,169,0,141,21,49,240
,61
710 DATA 201,11,208,17,206,21,49,173,2
1,49

720 DATA 201,255,208,47,169,39,141,21,
49,208
730 DATA 40,201,14,208,17,206,22,49,17
3,22
740 DATA 49,201,0,208,26,169,22,141,22
,49
750 DATA 208,19,201,13,208,15,238,22,4
9,173
760 DATA 22,49,201,23,208,5,169,1,141,
22,49
770 DATA 49,174,21,49,172,22,49,32,208
,50
780 DATA 201,0,240,81,201,10,240,85,20
1,1

790 DATA 240,81,32,154,52,56,233,1,72,
24,48
800 DATA 10,109,24,49,141,24,49,173,25
,49,10
810 DATA 105,0,141,25,49,104,10,10,10,
10,248
820 DATA 24,109,148,48,141,148,48,173,
149,48
830 DATA 48,105,0,141,149,48,205,153,4
8,208
840 DATA 24,238,152,48,32,209,53,32,15
4,52
850 DATA 32,209,53,32,154,52,173,153,4
8,24
860 DATA 105,16,141,153,48,216,32,40,5
0,32
870 DATA 223,50,96,104,104,206,152,48,
240,6
880 DATA 32,197,52,76,90,48,32,197,52,
32,0
890 DATA 103,52,32,40,50,76,42,48,173,
149,48
900 DATA 48,160,0,162,15,32,97,50,232,
232

910 DATA 173,148,48,32,97,50,162,0,236
,152,48
920 DATA 48,240,13,224,6,240,9,169,11,
232,32
930 DATA 32,139,50,76,60,50,169,0,232,
32,140
940 DATA 21,32,138,53,96,72,141,138,50
,162,0
950 DATA 72,138,72,173,138,50,41,240,7
,74,74
960 DATA 74,74,24,105,16,32,139,50,232
,173,148
970 DATA 138,50,41,15,24,105,16,32,139
,50,232
980 DATA 104,170,104,168,104,96,0,141,
10,212

1000 DATA 32,157,50,140,156,50,160,0,1
45,206
1010 DATA 172,156,50,96,0,72,152,72,13
8,72,10
1020 DATA 165,88,133,206,165,89,133,20
7,152,240

1030 DATA 17,24,165,206,105,40,133,206
,165,207
1040 DATA 105,0,133,207,136,76,170,50,
24,138
1050 DATA 101,206,133,206,165,207,105,
0,133,207
1060 DATA 104,170,104,168,104,96,32,15
7,50,140
1070 DATA 222,50,160,0,177,206,172,222
,50,196
1080 DATA 0,169,1,174,21,49,172,22,49,
32,50
1090 DATA 142,50,169,254,24,109,24,49,
133,206
1100 DATA 169,7,109,25,49,133,207,160,
0,177
1110 DATA 206,170,200,177,206,168,169,
0,32,142
1120 DATA 50,32,11,51,96,169,252,24,10
9,24,49
1130 DATA 49,133,203,169,7,109,25,49,1
33,204
1140 DATA 173,25,49,74,168,173,24,49,1
06,56

1150 DATA 233,1,170,152,233,0,168,138,
242,152
1160 DATA 72.168.0.177.203,160,2.145.2

03,160
1170 DATA 1,177,203,160,3,145,203,104,
168,104
1180 DATA 170,56,165,203,233,2,133,203
,165,204
1190 DATA 233,0,133,204,202,224,255,20
8,214,136
1200 DATA 192,255,208,209,173,21,49,14
1,0,8
1210 DATA 173,22,49,141,1,8,96,174,182
,51,32
1220 DATA 172,183,51,32,208,50,201,0,2
40,9
1230 DATA 201,1,240,5,169,10,32,139,50
,173,
1240 DATA 10,210,41,63,201,39,144,3,56
,233,
1250 DATA 39,170,173,10,210,41,31,56,2
33,1
1260 DATA 201,21,144,3,56,233,21,24,10
5,1

1270 DATA 168,32,208,50,201,0,208,217,
173,10
1280 DATA 210,41,7,142,182,51,140,183,
51,24
1290 DATA 105,2,32,139,50,96,0,0,165,1
06,
1300 DATA 56,233,8,141,244,2,133,207,1
33,213
1310 DATA 169,0,133,212,133,206,169,0,
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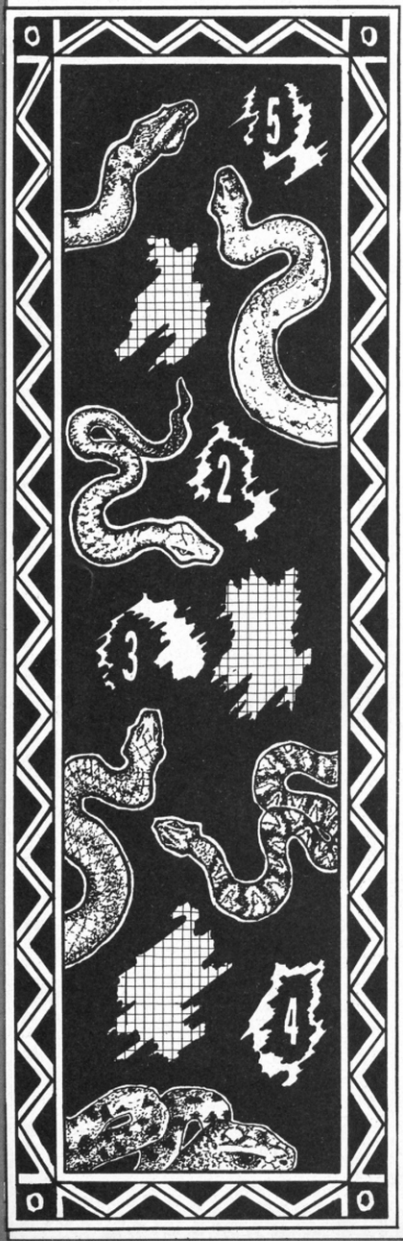
PCN PROGRAMS: ATARI 800

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1340 DATA 104,170,230,212,208,2,230,21
3,230,203
1350 DATA 208,2,230,204,202,224,255,20
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1360 DATA 192,255,208,220,160,8,185,25
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1380 DATA 195,195,195,195,255,8,8,8,8,
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1390 DATA 8,8,8,170,2,2,170,128,128,17
0
1400 DATA 0,170,2,2,170,2,2,170,0,130
1410 DATA 130,130,130,170,2,2,2,170,12
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1420 DATA 170,2,2,170,0,170,128,128,17
0,130
1430 DATA 130,170,0,170,2,2,2,2,2,2
1440 DATA 2,170,130,130,170,130,130,17
0,0,85
1450 DATA 85,85,85,85,85,85,85,56,84,2
14
1460 DATA 254,254,186,68,56,0,24,24,24
0
1470 DATA 0,0,0,173,149,48,205,151,48,
240
1480 DATA 4,144,22,176,8,173,148,48,20
5,150
1490 DATA 48,144,12,173,148,48,141,150
,48,173
1500 DATA 149,48,141,151,48,160,0,162,
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1510 DATA 151,48,32,97,50,232,232,173,
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1520 DATA 32,97,50,96,72,165,19,72,165
,20
1530 DATA 72,169,175,141,1,210,169,50,
141,0
1540 DATA 210,169,0,133,20,165,20,201,
5,208
1550 DATA 250,169,0,141,1,210,141,0,21
0,104
1560 DATA 133,20,104,133,19,104,96,165
,19,72
1570 DATA 165,20,72,169,143,141,1,210,
162,0
1580 DATA 134,20,142,0,210,232,165,20,
201,50
1590 DATA 208,246,169,0,141,1,210,141,
0,210
1600 DATA 104,133,20,104,133,19,96,160
,0,169
1610 DATA 0,162,1,32,138,53,160,14,169
,0
1620 DATA 162,20,32,138,53,162,17,96,1
38,72
1630 DATA 162,14,160,0,32,139,50,104,1
70,173

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8,234
1650 DATA 232,224,26,208,2,162,17,173,
31,208
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,138,50
1670 DATA 164,20,204,138,50,208,249,76
,2,53
1680 DATA 138,56,233,16,10,10,141,0,6,
96
1690 DATA 51,37,44,37,35,52,0,51,48,37

1700 DATA 37,36,26,255,48,50,37,51,51,
0
1710 DATA 51,52,33,50,52,0,52,47,0,34
1720 DATA 37,39,41,46,255,0,34,57,0,38

1730 DATA 50,33,46,43,0,47,12,36,55,57

1740 DATA 37,50,255,0,0,0,0,0,0,0
1750 DATA 0,6,0,0,0,0,0,0,0,0
1760 DATA 0,0,0,255,140,138,50,168,140
,169
1770 DATA 53,172,138,50,185,64,53,201,

255,240
1780 DATA 13,172,169,53,32,139,50,238,
138,50
1790 DATA 232,76,142,53,96,0,169,0,133
,212
1800 DATA 169,8,133,213,160,4,162,0,15
2,72
1810 DATA 160,0,169,0,145,212,104,168,
230,212
1820 DATA 208,2,230,213,202,224,255,20
8,235,136
1830 DATA 192,255,208,230,96,165,20,72
,165,19
1840 DATA 72,169,0,133,20,165,20,201,5
,208
1850 DATA 250,104,133,19,104,133,20,96
,165,20
1860 DATA 72,165,19,72,169,175,141,1,2
10,169
1870 DATA 200,141,0,210,169,0,133,20,1
65,20
1880 DATA 201,5,208,250,169,0,141,0,21
0,141
1890 DATA 1,210,104,133,19,104,133,20,

96,0
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PCN Billboard

Lynx 48K, manual, all leads, some software including assembler very good condition still in box. Cost £225, asking £140 ono. Tel Medway (0634) 30233.

Vic 20, 3K RAM, C2N cassette recorder, Joystick, with also s/ware, and magazines. Sale for £150 ono Tel New Milton (0425) 618200.

Intellivision Consol, as new, boxed, plus 7 of the best cartridges. Cost over £185, real bargain at £65. Call Ray Scott 01-969 5255 before 6pm.

BBC 400K 40/80 track disk drive Disc Doctor ROM and 20 software discs. value over £1,000, sell for only £300. Tel (05827) 69152.

ZX81 Computer 16K expansion, printer (all Sinclair), plus 4 printer rolls. Manuals. Good condition, lot £60. Russell. Tel: 01-690 2983.

Software for TRS—80 colour computer wanted: Roger. Orpington 20281.

Original Spectrum software Spectres, Gulpman, spectral Invaders, Automonopoli, Golf £1.50 each. Abersoft Forth £3, Black Crystal £2. M. Groll 31 Armitage Lane, Brereton, Rugeley, Staffs.

Spectrum Software: Hobbit and book, Black Crystal, £9 each, both unused. Vu-3D £6, Jetset, Sentinel, S. Panic, S. Raiders plus Airline. Each £3.50. Tel: Nik on Bitton 2366.

Atari VCS excellent condition includes 2 joysticks, and 2 paddles, and 2 driving controls. complete with 17 games. Tel: Weybridge (0932) 55203. Sell for £100ono.

Tandy Model 100 portable computer 24K RAM, cassette recorder, spreadsheet software. Cost £700, asking £400. 0734 594755 eves.

Spectrum software for sale. Many titles including Psytron, Atic, Manic, Stonkers. Most £3, some £4. Tel: 0282 601450. Ask for Richard (After 4pm).

CBM 64 + C2N joystick, reference guide, Ultisynth, Solo Flight, + over £200 of software and books. Bargain at £280. 92 Blake House, Lower Kersall, Salford 7 ORX.

HP85, with ROM Draw I/O ROM Assembler ROM IL interface and data plus program cassettes — £1,200ono. Tel: 01-670 6454 eves, 01-211 6034 daytime. Ask for Robert.

Wanted Arari disk drive, also sell Oric 1 48K plus £85 of original software, cassette recorder. Offers? or swap for disk drive. Tel: Mansfield (0623) 556432.

Dragon 32 complete with starter pack and tapes. Two months old. North Wales, Chwilog. Tel: (076688) 617.

Epson HX80 printer, near new £175ono. Tel: 01-441 4856 after 6pm.

Maplin-built Maplin modem, cased and cable for Atari 850, simple connection for other computers. Only £50ono perfect condition 2 months old. Tel: (0905) 42013.

Wanted: Spectrum second-hand software. Originals only. Will pay per tape of buy collection. Tape list to Val Abraham 173 Putnoc Street, Bedford MK41 8JR.

Sinclair ZX81 with 16K RAMpack and Sinclair printer. All new and boxed, only £55ono. Colden Common, Winchester. Tel: Twyford (0962) 714056 eves.

Must sell Arari 400 16K including Basic cassette recorder two Quickshot joysticks and also books and many games. £130ono or swap for BBC A or B any O/S. Woking 67454.

Oric 1 48K and £150 of software. Cassette recorder also included. Best offer over £120 secures, buyer must collect. Tel: Bradford (0274) 732089.

Atari 822 thermal 40 col printer. £50 with connector and paper. As new at one fifth original cost. Tel: Derby 811711. Delivery in 50 mile radius.

ZX printer paper rolls for sale. Total 25 rolls. What reasonable offers? Postage charge £2.20. Tel: 01-868 3784 (Pinner, Middx.).

48K Spectrum, ZX printer, cassette recorder, Currah speech unit. Plenty of software also included. £170 the lot. Tel: Birch, near Colchester (0206) 331207.

Commodore Pet 3032 32K, with 3040 dual disk unit and 3022 printer. Assembler software. All excellent condition. £795. Tel: Brighton (0273) 771577, after 6pm.

Swap Commodore 64, Disk drive, diskettes, box, cassette, cassette games, joystick, B/W TV, cover for Apple II+ or IIE disk drive, controller, monitor. Tel: Farnborough (Kent) 54195.

Commodore 64, C2N and 3 week old disk drive, with over £1,000 worth of software. Total value well over £1,500, sell for £500 (no offers). Tel: 05827 69152.

Spectrum software for sale £2.75 each. All originals. send for list: D J Brown 104 Bifield Rd, Stockwood, Bristol BS14 8TU. Tel: 0272 838333 (eves).

Atari 400, 48K 410 data recorder, joystick, mangzines + tons of top games, including Buck Rogers, Pooyan. Worth £500+. Bargain £230. Tel: (04427) 5434 (Alan).

Games for ZX Spectrum, Hobbit, Flight Simulation, Gulpman, Timegate, Ant Attack, Space Raiders, Ocean Kong, Rescue. £25 the lot or swap for Currah Microspeech. Peter 01-422 7583.

QL for sale. Offers? Also new Epson FX100 printer to suit. Tel: Gerrards Cross 0753 882686.

Vic 20 plus 16K tape deck, books, 70 games. All boxed and in vgc. Cost £300, will accept £150. Tel: Wickford (03744) 2869 anytime.

Dragon software wanted, also have some to swap (originals). Ugh! Junior, etc . . . Write — Ian, 37 Harehills Avenue, Leeds LS8 4EX, Yorks with list. Tel. no etc . . .

64 games for sale. Jungle-story, Squirm, Quintec-Warrior, Matrix, Crazy-Kong, Cybotron. All games as new. From £1.50 to £5. Tel: 01-646 0458 after 7pm. Ken.

Swap or sell BBC B with extras for Commodore 64 and disk drive of Commodore 64 plus money of £350. No offers. Tel: 051-263 3334.

Atari 400 with Basic, Buck Rogers cartridge, joystick and graphics book still under guarantee £60. Tel: Wrexham 753238.

All 74 issues of PCN + ZX Spectrum 48K under guarantee + £200 of software. Sabre Wulf + JSW + Match Point + tape recorder. Sell for £195ono. Tel: Stroud 6272.

Lynx 48K manual, printer interface, assembler and level 9 adventure software. Total cost over £300, asking £135. Tel: (0636) 812092.

Spectrum software Football manager, Hunchback, 1984, 3D-Space Attack, Bullseye, Whodunnit, (originals) swap lot for ZX printer. Tel: 061-643 4024 5pm-6pm.

Epson HX20, 16K RAM, expandable, built in screen and printer. Unwanted gift, worth over £400. Offers around £200. Tel: Slough 48184 after 7pm.

Spectrum Software, eight titles, worth £50. Will sell for £20. Includes Fred, Hunchback, etc. Plus Grandstand, Scramble game £5. Tel: (0728 88) 8145 (Kevin).

BBC software for sale. Footer, Sixers, Pedro, Swoop, Ghouls, Q-bert, Arnold Attack, Starship Command, Legion, asking £3.50 each. Tel: 01-736 7714 ask for Satvinder.

Wanted UK101 hardware RAM/EPROM/32×48 boards. Also Basic 1/2/3/5X Toolkit/Word Wizard all for Cegmon. Also any software. Tel: Sheffield (0742) 384474 after 6pm.

Vic 20 computer, C2N cassette deck, 6-slot motherboard expansion module plus mags. All vgc £150. Tel: Gary, Slough 71169 eves only.

Spectrum software swap Psytron Bugaboo Micro-Olympics for Sabre Wulf Daley Thompson's Decathlon. All original. Tel: 031-440 2083 after 4pm.

Commodore 64 disk drive, cassette recorder, joystick, printer interface for Centronics, Simons Basic, Spreadsheet, Easyscript, Superbase 64, Assembler plus several games and books. £500. 01-934 5962 daytime.

CBM 64 adventures Snowball, Colossal Adventure, Adventure, Quest, Dungeon Adventure, Ring of Power, (including booklets). Worth £50, sell £20 or swap. Tel. David 0783 227262.

Spectrum 48K plus 19 original games including The Hulk. Will swap for Oric Atmos 48K of sell for £110ono. Tel: Wendover (0296) 623423.

BBC B DFS Cumana double disk 800K Star Gemini. business software, word processor, all boxed. Stacks of manuals and books. £1,100ono. Tel: Southend 67285. Will deliver within reason.

Oric 48K 3 months old + books, software valued at £150 including Zorgon, Xenon, Collossal Adventure total value £280, asking £130ono. Tel: 0563 42816 eves.

48K Spectrum, DK 'Tronics keyboard, joystick and interface, tape recorder, £100 of software, magazines and books worth £350. Sell for £200ono. Tel: 01-851 1365 after 5pm.

Atari Basic cartridge £7, paddle controllers £4, cassette two power supplies £2 each Atari programs, book, £5, clock/radio £10, the lot for £24. Tel: (0792) 898363.

BBC B OS 1.2, 6 months old, £150 of games, books, excellent condition, sell for £350, or swap for CBM 64 with disk drive + C2N, excellent condition. Tel: (0924) 253251.

Floppy disks, 14 new discs, 10 with lifetime guarantee, 20 only — 5¼" double sided, double density. Ring Simon on Maidstone (0622) 832020.

Oric 1 and CBM-64 software wanted. Send your list of new titles to: Torfinn AAs, Ytreringvei 7100 Rissa, Norway.

Microwriter with TV interface unused £325. Epson MX 100 III matrix printer also unused £325. Tel: (05642) 2383.

Swaps, CBM 64 games to swap. Titles include Manic Miner, Forbidden Forrest, Hunchback, and many more. Write P. Hatch, 29 Reddicap Hill, Sutton Coldfield, West Midlands.

Vic 20, cassette unit, Super Lander cartidge, six tapes and three manuals £70ono. Home office, word processor and database, requires 16K expansion £10ono. Tel: (0632) 665780.

Atari software sale — Choplifter, Pole Position, (ROMS), Blue Max, Solo Flight and Diamonds all cassettes). Also swap for disk software. Tel: Dan 051-728 7492.

TRS-80 Model 1 level 2 with VDU manuals, books on progamming and assembly language. £75. Tel: Bristol 696819.

Vic 20, C2N, super expander 16K, cartridges, adventures, £70 worth of games, Maplin Voice synthesiser and lots more £120. Tel: 0934 510842.

Philips G7000 with 12 games including Munchkin and Freedom Fighters for sale £110ono. Tel: (0977) 661453 after 6pm plcase.

Electron and BBC software to swap or sell. Many titles. Also books and mags to sell. Tel: 01-986 5495 after 6pm and ask for Andy.

Colour Genie EG2000, 32K RAM. boxed and complete with demo and manuals. Immaculate unwanted gift, cost £265. Accept £140. Tel. Dave Southampton (0703) 897110.

33 PCNs, 19 Sinclair Users, 12 Sinclair Programs, 10 Home Computing Weekly. Good condition, will sell separately. Offers? Tel: Gowerton 873 548 after 6pm.

Newbrain owner would like to correspond with similar for information exchange, program conversions etc (Basic, Assembler, Pascal). Tel. Ray on Wolverhampton (0902) 51254.

Wanted: Pole Position for Atari 400. Will pay up to £20. Tel: Derby (0332) 700522 after 5pm.

16K Vic 20 (switchable) + cassette, £100 worth of software, Super Expander, cartridges, lightpen, speech recognition, books, mags. Worth £460, accept £230. 01-521 9952, 52 Havant Rd, Walthamstow, London E.17.

48K Spectrum, Kempson joystick interface. Software including Hobbit, Fighter Pilot, Android 2. Complete with leads manuals etc. Must sell, £120. Tel: Ringwood (04254) 4068.

Flight Simulator II, Starting a specialist user group for Sublogic's Masterpiece. Newsletter exchange user mode disks. Annual air race. Tel. Ray Jones (09803) 8865.

Vic 20 for sale, including cassette unit, 16K switchable memory expansion, joystick. Manuals, books, over £75 worth of software. Bargain at £115. Fleet (02514) 22779.

Atari software: Jumbo Jet Pilot + Kingdom + Golden Baton. All three for £15 of swap for Pole Position. Tel: Derby (0332) 700522 after 5pm.

Sharp PC1211 plus CE122 Plus CE121 plus instructions. £120. Commodore printer 1023 £100. Tel: 041-204 1004.

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BACK ISSUES

Copies of Issues 1 to 13 are still available from our Back Issues Department (see order form on next page). For details of their contents please call Gina Setchfield on 01-439 4242.

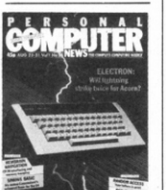
Issue 20, July 21-July 27
Pro-Tests: Rade bareboard, Vic digital tape drive, Seikosha colour printer, Toolkit (Spectrum), Bonus (Pet payroll), Newbrain monitor.
Features: Computer art, Dragon scrolling.
Gameplay: Rabbit Trail (TI99/4a), Aztec Challenge (Atari, Vic 20, TI99/4a), BBC round-up, Joust (Spectrum), Molar Maul (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).
ProgramCards: Tumbler (Oric), Wreck (Dragon), Atari Errors Speed Race (Vic 20).
Micropaedia: Sound, part 4.

Issue 21, July 28-August 3.
Pro-Tests: BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.
Gameplay: Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).
ProgramCards: Collection (Vic), Bomber (64), Definer (BBC).
Micropaedia: Sound, part 5.

Issue 22, August 4-August 10.
Pro-Tests: Spectrum Forth, BBC graphics, Music synthesisers, IBM plotter, Brother daisywheel, Maltron keyboard, Mupid.
Features: Genie assembler, Dragon machine code.
Gameplay: River Rescue, Orc Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Moria (Oric), Velnor's Lair (Spectrum).
Micropaedia: CP/M part 1.

Issue 23, August 11-August 17.
Pro-Tests: Sord Basic-G, Tasword, BBC microfloppics, Microdrive, Tandy Model 4.
Features: Dragon machine code, Atari controllers.
Gameplay: Bridge Master, Styx, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (Oric), Everest (Dragon).
Micropaedia: CP/M, part 2.

Issue 24, August 18-August 24.
Pro-Tests: T-Maker III, Spectrum Fifth, daisywheels surveyed, Spectrum digital tracer, Laser.
Features: Videotex, Dragon machine code.
Gameplay: Oric roundup, Cookie, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (64).
Micropaedia: Commodore 64, part 1.



Issue 25, August 25-August 31.
Pro-Tests: Electron, Simons Basic, Oric monitors, Microdrive.
Features: Newbrain map, Acorn Atom, Dragon machine code.
Gameplay: Suspended (64), Terror Daktils, Tranz AM (Spectrum), Dragon roundup, Jogger (Oric), Frogger (IBM).
Micropaedia: Commodore 64.

Issue 26, September 1-September 7.
Pro-Tests: Microtan 65, BCPL, BBC tracer, 80 column Pet, Oric interfaces.
Gameplay: Magic Mountain, Smuggler's Cove (Spectrum), Spectrum roundup, Matrix), (64), Ninja Warrior (Dragon), Dallas, (Oric), Call to Arms (IBM).
Micropaedia: Commodore 64.

Issue 27, September 8-September 14.
Pro-Tests: Sharp MZ700, BBC Lisp, Apple editor, IBM mice, ZX81 surgery.
Gameplay: Zip-Zap, Zzoom (Spectrum), Spectrum roundup, Hoover Bowver, Benji-Space Rescue (64).
Micropaedia: Dragon, part 1.

Issue 28, September 15-September 21.
Pro-Tests: Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM mice.
Gameplay: The Witness, Super Scramble, Six (64), Barrier Attack (Oric), Morocco Grand Prix (Dragon), Pharoah's Tomb (Spectrum.
Micropaedia: Dragon, part 2.

Issue 29, September 22-September 28
Pro-Tests: Portico Miracle, Dragon editor, BBC toolkit, Dragon drives. Apple light pen.
Features: HX20 disassemblies. TI transformations.
Gameplay: Gridder, Gloopert, California Gold Rush (64), Oric roundup, Bomb Alley (BBC). Splat, General Election (Spectrum).
Micropaedia: Dragon, part 3.

Issue 30, September 29-October 5.
Pro-Tests: NEC's Advanced Personal Computer, Financial Planner (IBM), Kongman's a.b.c. Countabout Hot Dog Spotter (Spectrum), Prism VTX5000, Extended Basic (Dragon).
Features: Spectrum machine code.
Gameplay: Halls of Death/Sword of Fargoal (64), 747 Flight Simulator (BBC), Dragonfly (Dragon 32). Forensic/Note Invaders (BBC).
Programs: Search (ZX81), Composer (Oric).
Databasics: Hardware.
Micropaedia: Everything you wanted to know about programming, part 1.
Clubnet: Clubs.

Issue 31, October 6-October 12.
Pro-Tests: Atari 600XL, Condor Series 20 (IBM), Acacia Non-volatile Diary/Filing system (BBC), ROM extension board (BBC).
Features: Oric sound routines.
Gameplay: Greedy Gulch (Spectrum), Kong (Spectrum), Crazy Kong (64), Cuthbert Goes Walkabout/Movie Producer (Dragon).
Programs: Composer (Oric), 555 (Spectrum), Anagrams (Dragon).
Databasics: Peripherals.
Micropaedia: Everything you want to know about programming.
Clubnet: User Groups.

Issue 32, October 13-October 19.
Pro-Tests: Mattel Computer Adaptor (Intellivision), Sprite-Gen (BBC), Typing Strategy (Apple), MCoder 2 (Spectrum), Cirtech Eprom Programmer (Apple).
Features: Telesoft options, Inside the Genie.

Gameplay: Space Shuttle Frogger (Dragon 32), Atari roundup, Spectadraw 2/Football Pools Program (Spectrum).
Databasics: Software.
Clubnet: Clubs.
Programs: Bees Away (BBC), Composer (Oric).
Micropaedia: Everything you wanted to know about programming, part 3.

Issue 33, October 20-October 26.
Pro-Tests: C/WP's Cortex, Sinclair ZX Interface 2, Watford DFS (BBC), Wordsworth (BBC), Atariwriter.
Features: Oric Operating System.
Gameplay: Dragon roundup, Hustler (64), Cricket/Luna Crabs (Spectrum), 3 Deep Space (BBC).
ProgramCards: Key Utility (Lynx), Bees Away (BBC), French Test Card (Apple).
Micropaedia: Everything you wanted to know about programming, part 4.

Issue 34, October 27-November 2.
Pro-Tests: NEC's PC-8201A, Simply File (64), The Forest (Spectrum), Amcom DFS (BBC), Curah Microspeech (Spectrum).
Features: Oric Machine Code.
Gameplay: Fort Apocalypse/Pooyan (Atari), Death Cruise/I Ching (Dragon), Trench/Canyon (BBC), Football Manager/Pool (Spectrum).
Programs: French Test (Apple), Babyfall (ZX81), Count (Vic 20), Men/Arith (Vic 20), Road Hog (BBC).
Databasics: Hardware.
Micropaedia: Everything you wanted to know about programming, part 5.

Issue 35, November 3-November 9.
Pro-Tests: Kaypro 10, Stock Control (Spectrum), Educational games (BBC), Brother EP22 electronic typewriter, ADS Centronics Interface (Spectrum, Jupiter Ace).
Features: Tandy Graphics, BBC Operating System.
Gameplay: Valhalla (Spectrum), 64 roundup, Slinky (Atari), Hexpert (64).
Programs: Mini Math (Spectrum), Multi-Square (Oric).
Databasics: Peripherals.
Micropaedia: Everything you wanted to know about programming, part 6.

Issue 36, November 10-November 16.
Pro-Tests: Tiger from H/H, ZX81-Forth, Exmon (Oric), Cycle Planner, Growth Tracker/Dieta/Diet Master (Spectrum), U-Com 2 (Apple).
Features: Newbrain sound, BBC FX commands.
Gameplay: Creepers (Vic 20), Exterminator (64), Spectrum roundup, Death Mines of Sirus (Dragon).
Programs: Falklands Raid (BBC), Mini Math (Spectrum), Pyramid (Spectrum).
Databasics: Software.
Micropaedia: Everything you wanted to know about programming, part 7.

Issue 37, November 17-November 23.
Pro-Tests: Apricot, Paint (Atari), BBC Micro Toolbox, Spectravideo Compumate (Atari VCS 2600), Big Ears.
Features: Flight simulators, Spectrum screening.
Gameplay: Empire/Treasure Tomb, Crystal Chalice, Temple of Zoren (Dragon 32), Cobus Maze/Bewitched (Vic 20), Cosmic Convoy/Planetfall (64), Bugaboo/Gorgon (Spectrum).
Programs: City Defense (Oric), Falklands Raid (BBC), Pyramid (Spectrum), Monitor (64).
Databasics: Clubnet.
Micropaedia: Everything you wanted to know about programming, part 8.

Issue 38, November 24-November 30.
Pro-Tests: Coleco's Adam, Small Business Accounts (Spectrum), Masterfile (BBC), Monitor roundup.
Features: Apple programming, NewBrain editor part 1, Dragon action part 1.
Gameplay: Dragon roundup, Zeppelin/Blue Max (Atari), Skramble/Falcon Patrol (64), 737 Flight simulator (BBC).
Programs: Shipment (Spectrum), Monitor (64).
Databasics: Hardware.
Micropaedia: Guide to Monitors.

Issue 39, December 1-December 7.
Pro-Tests: Dragon 64, Tandy CGP-220, White Knight II (BBC), Cross Reference Utility (IBM).
Features: NewBrain editor part 2, Dragon Action part 2.
Gameplay: Oric roundup, Haunted Hedges/Corridors of Genon (Spectrum), Microbe/One Hundred & Eighty (BBC), Atari roundup.
Programs: Lower CLS (Spectrum), Shipment (Spectrum), Monitor (64), Basic Search (BBC).
Micropaedia: Buyer's Guide to Micros.

Issue 40, December 8-December 14.
Pro-Tests: Timex 2058, Thermal Printer TP-10, Cambridge Computing joystick (Spectrum), Beebsynth/The Synth/Music Processor (BBC), Vizawrite/Vizaspell (64), Education games (Spectrum).
Features: NewBrain editor part 3, Dragon Action part 3.
Gameplay: Pinball Wizard (Vic 20), The Quest of Merravid (64), Wavy Navy/Savage Pond (Atari).
Programs: Link Four (Spectrum), Tilt (Dragon).
Micropaedia: Buyer's Guide to Peripherals.

Issue 41, December 15-December 21.
Pro-Tests: Apple II, Byte Drive 500, INMAC Power Cleaner, Commodore 701 Colour Monitor, BCBasic (64), Database/MST-Calc (Dragon).
Features: Computerised Psychotherapy (BBC), Spectrum Display.
Gameplay: Micropoly/Pettigrew's Diary (Dragon), Pi-Eyed-Roundup, Dimension Destructors/Shoot Panic (Spectrum).
Programs: Invader (Spectrum), Grid Bike (Vic 20).
Micropaedia: Buyer's Guide to Software.

Issue 42, December 22-January 4.
Pro-Tests: Spectrum add-ons (U-Microcomputers system), Oric-1 Filestar, Games Designer (Spectrum).
Features: Micros of 1983, Computer Security, BBC word processing, Dragon Action part 4.
Gameplay: International Football (64), Grouch/Chequered Flag (Spectrum), Way Out/Jet Boot Jack (Atari), Super-vaders/Outback (Vic 20), Danger Ranger/Up Periscope (Dragon 32).
Databasics: Clubnet.
Micropaedia: Games Special.

Issue 43, January 7.
Pro-Tests: IMB Junior, Grafpad (BBC), Walters WM80 printer Devpac (Spectrum).
Features: Computerspeak, Spectrum Display, Tabs on Oric.
Gameplay: Trace Race/Pinball (Dragon 32), Colour Genie roundup, Hunter Killer/Mr Wimpy (Spectrum), Crazy Caveman/Goodness Gracious (64).
Programs: Jungle Chase (Oric), Screen Dump (BBC).
Databasics: Hardware.
Micropaedia: Electron part 1.

Issue 44, January 14.
Pro-Tests: Hitachi MBE-16002, Acorn Teletext (BBC), Integrex Colourjet printer, DTL-Basic (64), Elan/Microprint 42/51/Multifront (Spectrum).
Features: Adventure games, Colour Genie characters.
Gameplay: Devil Assault/Wasps + Dragon Racer (Dragon 32), Siren City/Forbidden Forest (64), Survival/Countdown (Vic 20).
Program: Minefield.
Databases: Peripherals.
Micropaedia: Electron part 2.

Issue 45, January 21.
Pro-Tests: Portables — Commodore SX64, Olivetti M10; Acorn sparkjet printer; Turbo 20 daisywheel; Spectrum educational software; BBC graphics extension ROM.
Features: Bargain buys; Making money with your micro
Gameplay: Viking and Pub Crawl (Dragon), Traxx and Wild West Hero (Spectrum), Atari/Commodore 64 round-up.
Programs: Battlestar Fighter (Commodore 64).
Databasics: Software.
Micropaedia: Electron part 3.

Issue 46, January 28.
Pro-Test: Apple Macintosh; BBC sideways ROM board; IEEE interfaces for Commodore 64. Silver Reed EX44 typewriter/printer; Bridge on Spectrum and Dragon; BBC filing program.
Features: Buying by mail order; programming the Memotech.
Gameplay: Barmy Burgers and Gangsters (Spectrum), Birdie Barrage and Plankwalk (BBC), Blue Moon and Dancing Feats (Commodore 64).
Programs: Caves of Treasure (ZX81).
Clubnet
Micropaedia: Modems and communication.

Issue 47, February 4.
Pro-Tests: Sinclair QL; Atari Touch Tablet; Silver Reed EXP500 daisywheel; IBM Cobol; BBC Spell Check.
Features: Programming the Memotech part 2; Low cost printers.
Gameplay: Mothership and Quintic Warrior (Commodore 64), Two Gun Turtle and Multigames (Oric), Apple adventures. Spectrum round-up.
Programs: Pot Hole (Dragon)
Databases: Hardware.
Micropaedia: A to Z of Atari part 1.

Issue 48, February 11.
Pro-Tests: Spectravideo 328; Atari 800 XL; Dragon 3in disk drives; low cost monitors; Aztec C (Apple); BBC educational software.
Features: Sideways printing on Epson HX20.
Gameplay: Bedlam and Morris Meets the Bikers (Spectrum); Commodore 64 round-up; Zorgon's Kingdom and Flight Zero-One-Five (Vic 20).
Programs: Gridtrap (Lynx).
Databases: Peripherals.
Micropaedia: A to Z of Atari part 2.

Issue 49, February 18.
Pro-Tests: Oric Atmos; tracker ball controllers; Spectrum speech synthesisers; Rainbow Writer (Dragon); Colour Genie assembler; Spectrum educational programs.
Features: Computer jargon; 42-column display on Spectrum.
Gameplay: Quadrant and Jetpac (Vic 20); Crazy Balloon and Supacatchatroopa (Commodore 64).
Programs: Sprite generator (Commodore 64).
Databases: Software.
Micropaedia: A to Z of Atari part 3.

Issue 50, February 25.
Pro-Tests: Sanyo MBC550; Commodore speech syntheiser; BBC real-time control interface; BBC machine code trace; Atari home utilities.
Features: Expanding your Spectrum; introduction to Lisp.
Gameplay: Urban Upstart and Godzilla and the Martians (Spectrum), Shuttlezap and Hooked (Dragon).
Programs: Minescape (Oric).
Clubnet
Micropaedia: Printers part 1.

Issue 51, March 3.
Pro-Tests: Sharp's PC5000; Graphics Package (Oric), Fancy Font (CP/M, Torch), Superbase Application Database (64), Printer round-up, IEEE 488 Interface (BBC).
Features: Microdrive data files.
Gameplay: Spectrum selection, Robopods (TI99/4A), Batty Builders/Bristles (Atari).
Programs: Millipede (BBC/Electron).
Databasics: Hardware.
Micropaedia: Printers, part 2.

Issue 52, March 10.
Pro-Tests: Wren, MSX, Multisynth 64, Mr T's Number Games etc (BBC, Spectrum, 64), Hybrid cable (Oric, Atmos).
Features: Adventure games.
Gameplay: Dragon roundup, Snorter/Free Fall (BBC), Spectrum roundup.
Programs: UFO (Vic-20), Morse Code (BBC), Gary the Guitar (64).
Databasics: Peripherals
Micropaedia: Printer, part 3.

Issue 53, March 17.
Pro-Tests: Yamaha YIS503, Tandy TRS-80 modem (RS232), MDDFS (BBC), Toolkit (BBC), The Quill (Spectrum).
Features: Screen technology, Atari graphics.
Gameplay: Megahawk/Megawarz (64), Castle of Doom/Fishy Business (Dragon 32).
Programs: Battle Stations (Spectrum).
Databasics: Software.
Micropaedia: Reaching for the Atmos, part 1.

Issue 54: March 24.
Pro-Tests: IBM's Portable PC, Spectrum keyboards, Beebfont, Games Designer (Vic-20).
Features: Atari graphics, Chip shortage.
Gameplay: Airstrike 2/Pole Position (Atari), Deathchase/Flight Pilot (Spectrum), BBC roundup.
Programs: Othello (64), Charpatt (CGI, M-5).
Clubnet: User groups and clubs.
Micropaedia: Atmos, part 2.

Issue: 55, March 31.
Pro-Test: H-P 150, Light pens (BBC, 64), Micro-Prolog (Spectrum), Electron Graphics System.
Features: Spectrum routines, Consumer rights.
Gameplay: Patience/Metagalactic Llamas Battle at the Edge of Time (Vic-20), Loki/Rat Splat (Oric), Tennis (Atari).
Programs: Fast Draw (Dragon 32), Flash simulator (Atari).
Databasics: Hardware.
Micropaedia: Communications, part 1.

Issue 56, April 7.
Pro-Tests: Votrax Type 'n Talk, Micro Command (BBC, Spectrum, 64), Commodore 1001 disk drive, Apple's Macintosh, Animator (Dragon 32), Knoware (IBM).
Features: Spectrum maths, Adventure in history.
Gameplay: Hunchback Aztec Challenge (64), Defence Force/Psycho II (Oric), Volcanic Planet (Spectrum).
Programs: Ape King (Vic-20), Lynx VAL.
Databasics: Peripherals.
Micropaedia: Communications, part 2.

Issue 57, April 14.
Pro-Tests: Microkey, Morex Disk Drive Interface (Spectrum), Atari 1020 colour printer/plotter, FT Moneywise (IBM PC, Sirius).
Features: Assembly course, Portables.
Gameplay: Learning games (Spectrum, Oric), Air Traffic Control/Super Spy (Dragon), Neptune's Daughters/China Miners (Commodore 64).

Issue 58, April 21
Pro-Tests: Wrap-Bit Rabbit, Prism Apple graphics, Edword BBC word processor, Bynamic Graphics/Rainbow/Melbourne Draw graphics toolkits on Spectrum, Premier Sprite board for Dragon.
Features: Commodore 64 extended Basics, Microdrives made easy.
Programs: C-File database for Spectrum 48K.
Micropaedia: Spectrum, 64, BBC games reviewed.

Issue 59, April 28
Pro-Tests: Grid Compass, Husky Hunter, Canon X-07, Apple Homeword, Commodore 64 CP/M, Dragon Sprite Magic, Atari printers, Minor Miracles modem.
Features: Assembler language.
Programs: Huebert for Oric.
Micropaedia: Spectrum, BBC, Dragon, Atari games reviewed.

Issue 60, May 5
Pro-Tests: TRS80 4P portable, BBC Disk Doctor, Spectrum Tasword II, Quinkey keyboard, Bob robot.
Features: Oric FILL command.
Gameplay: Psytron and Red Baron (Spectrum), Avenger and Dragon Hawk (Dragon), Colour Genie round-up.
Programs: Poison Toad on Commodore 64.
Micropaedia: Graphics on Commodore 64, Oric and Atari.

Issue 61, May 19
Pro-Tests: Epson PX-8, Apple Pro-DOS, Commodore 64 Colossus 2 chess, Dragon Sprint compiler, Solidisk RAM expansion for BBC
Features: Artificial intelligence, assembler Pt 3.
Gameplay: Atari round-up, Commodore 64 round-up, Quest and Last Sunset for Lattica (Spectrum).
Programs: BBC/Electron 3D graphics, Oric renumber, Commodore 64 split screen graphics.

Issue 62, May 26
Pro-Tests: Compaq, Dragon OS9, Spectrum educational packages, ExpressBase II, BBC buggies, Commodore 64 Koala graphics pad.
Features: Spectrum sound, Japanese peripherals.
Gameplay: Rapedes and 1984 (Spectrum), House of Death and Operation Gremlin (Oric).
Programs: Dragon hi-res graphics, Commodore 64 graphics, Spectrum array sort.

Issue 63, June 2
Pro-Tests: Apple IIc, Sord IS11, Canon dot matrix printer, Oric disk drives, Acorn 6502 processor and Bitstick graphics system, Dragon sound packages, Commodore 64 speech synthesiser.
Features: Oric Budget, assembler Pt 4.
Gameplay: Galactic Warriors, Magic Meanies (Spectrum), Flying Feathers and Plumb Crazy (Commodore 64).
Programs: Oric assembler/disassembler.

Issue 64, June 9
Pro-Tests: IBM PC Jr, Lo Profile Spectrum keyboard, Riteman printer, Complete Apple Graphics System, Dragon word processor.
Features: BBC graphics, Spectrum ROM calls, Memotech machine code.
Gameplay: BBC round-up, Pub Quest and Chinese Juggler (Commodore 64).
Programs: Spectrum 16K/48K arcade game.

Issue 65, June 16
Pro-Tests: Amstrad CPC464, Apple CP/M Gold Card, Fidelity CM14 colour monitor, Quizz-style software on BBC and Spectrum, Dragon toolkit.
Features: IBM compatibles, Oric graphics.
Gameplay: Spectrum round-up, Bongo and Chariot Race (Vic 20).
Programs: Disk catalogue for BBC.

Issue 66, June 23
Pro-Tests: Advance 86, Indus GT disk drive (Atari), IBM database, Computer cookery aid.
Features: Commodore CP/M cartridge, Dragon graphics.
Gameplay: Jungle Hunt and Arena 3000 (Atari), Bed Bugs and Sword Master (BBC/Electron).
Programs: Reactor Force game for Oric 1.

Issue 67, June 30
Pro-Tests: Torch Unicorn Unix system, Apple mouse, MTX disk drives, Commodore 64 Flight Simulator II, Spectrum toolkit.
Features: Atari graphics, Adventure column, Assembler on Z80.
Gameplay: Laser Zone and Buzzard Bait (Dragon), Two for Spectrum 48K.
Programs: Hunchback-style BBC game.

Issue 68, July 7
Pro-Test: Osborne Encore
Pro-Tests: Tandy TRS-80 Model 2000, Electron joystick interface, Acorn Z80 second processor, Pascal on Commodore 64, IBM accounting.
Features: Spectrum Basic, Noddy on Memotech, Adventure column.
Gameplay: 48K Spectrum roundup, if I had a Million and Space Fighter (Dragon).
Programs: Drum emulator on Oric 1.

Issue 69, July 14
Pro-Tests: Casio FP-200, Plus 1 Electron interface, Spectrum joystick interface, Graphics Magician on Apple, Dragon databases.
Features: BBC sound, BBC factorials, Z80 Assembler series.
Gameplay: Tornado Low Level and Dartz (Spectrum), Submarine Commander and Tank Commander (Atari).
Programs: Strategy game on Dragon.

Issue 70, July 21
Pro-Tests: Tatung Einstein and TPC-2000, Portman modem, Eidmate light pen on 64, Datagem BBC database.
Features: Dragon graphics, Spectrum bubblesort.
Gameplay: Bruce Lee and The Hulk (Atari), Oric/Atmos roundup.
Programs: Space game for BBC.

Issue 71, July 28
Pro-Tests: Aquarius II, Sweet P plotter, Ultradrive micro tape for BBC, Spectrum filing system, Commodore painting package.
Features: Spectrum software security, Adventure column, Vic 20 Basic.
Gameplay: Aviator and Flint's Gold (BBC B). Captain Sticky's Gold and Flak (Atari).
Programs: Vampires game for Oric 1.

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If Thor can get past the dinosaur and into the cave, he has only a short way to go to rescue Cute Chick. On his way, Thor must duck under stalagtites and jump over stalagmites to avoid crashing.

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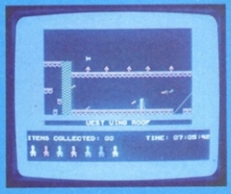
He hasn't explored his mansion properly yet (it IS a large place and he HAS been VERY busy) and there are some very strange things going on in the further recesses of the house (I wonder what the last owner WAS doing in his laboratory the night he disappeared).

You should manage O.K. though you will probably find some loonies have been up on the roof and I would check down the road and on the beach if I was you.

Good luck and don't worry, all you can lose in this game is sleep.



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Next New Brain meeting: 'De Bron' Technical College, Vaderrijndreef 7, Utrecht, Neth. On Sat. Sept. 22, 10-16hrs.
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Santa banter

Ho, ho, ho, boys and girls, only three months left until Christmas and Tatung is already making free with silly publicity photographs. Can Santa grow a beard by Christmas?

What we want you to do is put words into Mother Christmas's mouth or a caption to the picture, and send it to *PCN* at Evelyn House, 62 Oxford Street, London W1A 2HG. The finest example of sparkling wit wins £20 in this Laughline competition — we'll announce the winner in issue 81.

SYNTAX ERRORS

There were several errors in the listing of Cupid Bounces Back in the programs section of issue 75.
The tilde in line 80 should a 7
The tilde in line 1600 should be a 2
Line 530 should end GOTO 510
In the data starting at line 540 the line numbers for the check sums have been repeated and you must change these to 645 instead of 650; 755 instead of 760; 865 instead of 870 and so on.

Finally the direct command which moves the machine code to a different location (printed at the bottom of the text) should be entered as two lines returning after the first NEXT A.

Zircon Software, producer of *Thermonuclear War* on the Dragon, caught some fallout from its mention in last week's Software Preview. Its telephone number is 01-986 3369, not 3368 as we printed.

Rade Systems' R-50 route to CP/M for BBC users (Monitor, issue 76) is on sale now; the mid-November launch date we unaccountably gave it is just four months late.

Issue 75's Charts mistook Ocean's Decathlon for Activision's in an illustration.

NEXT WEEK

Hands up — *How small can micros go? We have the answer, with Pro-Tests of hand-held micros from Casio and Psion.*
Two's complement — Ashton-Tate's *dBase III gets the twice-over in this review.*
64 and more — *We show you how to order your Commodore 64 about with this survey of available commands.*
Gameplay — *Reviews of the latest games for the Commodore 64 and the Amstrad CPC464.*
Programs — *Another nail in the coffin of the old English pub — we offer you dominoes on the Spectrum.*

Switched-on to innovation

Here it is at last, the ultimate computer peripheral. Computerworld has just launched a reset-switch box for the Spectrum, Oric/Atmos, and Electron.

This mind-blowing bit of kit, which features a plastic ABS box with a superior on/off switch, saves wear and tear on the power plug of these machines. One special feature is its availability in three different colours, red, black, and white, to allow tasteful matching to your machine.

The most amazing thing about the reset-switch box is the price, a snip at £4.49.

PCN thought it should be easy to design a cheaper, do-it-yourself version so here goes. It consists of a switch. It's that easy. A variety of these are available, but it should be possible to pick one up at the nearest Woolworth store for a modest sum (certainly under £2). The best kind is one with screw connections so you don't have to do any of that nasty dirty soldering.

PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

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Event	Dates	Venue	Organisers
Info North	Sept 18-20	Belle Vue, Manchester	BED Exhibitions 01-647 1001
PCW Show	Sept 19-23	Olympia, London	Montbuild, 01-486 1951
Computer Communication & Control	Sept 26-28	Brighton Centre	Institution of Electrical Engineers, 01-240 1871
Computer Technol Exhbn — Comtec	October 3-5	Spennymoor, co. Durham	Industry Section, Sedgefield District Council, 0388-816166
Computer Graphics FX Exhibitions	October 9-11	Wembley, London	Online Conferences Ltd, 01-868 4466
Apricot & Sirius Computer Show	October 16-18	Manchester	Paradox Group Ltd, 01-241 2354
London Business Equipment Exhbn — LBES	October 23-26	Earl's Court, London	BED Exhibitions, 01-647 1001
Electron & BBC Micro User Show	October 25-28	Alexandra Palace, London	Database Publications, 061-456 8383
Home Tech '84	October 26-29	Exhbn Complex, Bristol	Nationwide Exhibitions, 0272-650465/15
Computers in Action	Oct 30-Nov 1	Anderson Centre, Glasgow	Trade Exhibitions 0764-4204

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
SE Asia Regional Computer Conference	Sept 24-27	Hong Kong	Industrial & Trade Fairs International, 021-705 6707
Caribbean Computer & Commun Exhbn and Conf — Caribecom	Sept 25-27	San Juan, Puerto Rico	AESI Ltd, 01-379 7628
Comp Graphics Exhbn — CAMP	Sept 25-28	Berlin, W. Germany	Spectrum Comms Ltd, 01-749 3061
Comp Conf & Exhbn — Mini/Micro Northwest & Northcon	October 2-4	Seattle, USA	Electronic Conventions Inc, 8110 Airport Boulevard, Los Angeles CA 90045

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